

**VOLUME 2 OF 3  
FINAL REPORT**

US EPA RECORDS CENTER REGION 5



471523

**REMEDIAL ACTION WORKPLAN  
ALBION-SHERIDAN TOWNSHIP  
LANDFILL  
CALHOUN COUNTY, MI**

*Prepared for*  
Cooper Industries  
Houston, Texas

and

Corning, Inc.  
Corning, New York

August, 1997

**Woodward-Clyde**



38777 West Six Mile Road  
Suite 200  
Livonia, Michigan 48152  
6E13045

**VOLUME 2 OF 3  
FINAL REPORT**

**REMEDIAL ACTION WORKPLAN  
ALBION-SHERIDAN TOWNSHIP  
LANDFILL  
CALHOUN COUNTY, MI**

*Prepared for*  
Cooper Industries  
Houston, Texas

and

Corning, Inc.  
Corning, New York

August, 1997

**Woodward-Clyde** 

38777 West Six Mile Road  
Suite 200  
Livonia, Michigan 48152  
6E13045



# TABLE OF CONTENTS

<b>Section 1</b>	<b>Introduction .....</b>	<b>1-1</b>
1.1	Purpose Of The Work Plan .....	1-1
1.2	Document Organization .....	1-1
<b>Section 2</b>	<b>Site Background.....</b>	<b>2-1</b>
2.1	Site Description.....	2-1
2.2	Summary Of Previous Activities .....	2-3
<b>Section 3</b>	<b>Remedial Action Scope Of Work .....</b>	<b>3-1</b>
3.1	Purpose Of Selected Remedial Action.....	3-1
3.2	Description Of Remedial Action .....	3-1
3.3	Remedial Action Supporting Documents .....	3-4
3.4	Remedial Action Construction.....	3-5
3.4.1	Preconstruction Inspection And Meeting.....	3-5
3.4.2	Prefinal Construction Inspection.....	3-6
3.4.3	Final Construction Inspection .....	3-6
3.4.4	Prefinal Construction Inspection Report.....	3-6
3.4.5	Final Construction Report.....	3-6
3.5	Contingent Remedy .....	3-7
3.5.1	Contingent Remedy Groundwater Monitoring Report .....	3-7
3.5.2	Work Plan, Pilot Testing, And Design Of Groundwater Treatment System .....	3-7
3.5.3	Construction Of Groundwater Treatment Systems.....	3-8
3.6	Remedial Action Completion .....	3-9
3.6.1	Completion Of Remedial Action .....	3-9
3.6.2	Completion Of Work .....	3-9
3.7	Materials Acceptance.....	3-9
<b>4.</b>	<b>Project Organization And Responsibilities .....</b>	<b>4-1</b>
4.1	Responsibility .....	4-2
4.1.1	Project Coordinator.....	4-2
4.1.2	U.S. EPA Project Manager .....	4-2
4.1.3	Engineer .....	4-2
4.1.4	Resident Engineer .....	4-3
4.1.5	Design Engineer.....	4-4
4.1.6	Site Health And Safety Officer .....	4-4
4.1.7	Quality Assurance Officer .....	4-4
4.1.8	QA Surveyor .....	4-4
4.1.9	Contractor(S).....	4-5
4.1.10	Community Relations .....	4-5





# TABLE OF CONTENTS

---

<b>Section 5</b>	<b>Project Communication.....</b>	<b>5-1</b>
5.1	Correspondence Control .....	5-1
5.1.1	Incoming Correspondence .....	5-1
5.1.2	Outgoing Correspondence .....	5-1
5.1.3	Distribution And File Copy Protection.....	5-1
5.1.4	Facsimiles And Letters .....	5-1
5.1.5	Telephone Conversations.....	5-2
5.2	Meetings.....	5-2
5.2.1	Preconstruction Inspection/Meeting .....	5-2
5.2.2	Progress Meetings.....	5-2
5.2.3	Problem/Deficiency Meetings .....	5-3
5.2.4	Prefinal Inspection/Meeting.....	5-3
5.2.5	Final Inspection/Meeting .....	5-3
5.3	Quality Assurance/Quality Control.....	5-3
5.4	Progress Reports .....	5-4
5.5	Storage Of Records .....	5-5
5.6	Final Certification .....	5-5
5.7	Site Visits .....	5-5
5.8	Site Photographs .....	5-5
5.9	Requests For Information .....	5-6
<b>Section 6</b>	<b>Construction Permits.....</b>	<b>6-1</b>
6.1	Construction Permits.....	6-1
<b>Section 7</b>	<b>Project Schedule .....</b>	<b>7-1</b>
7.1	Project Deliverables .....	7-1
7.2	Project Schedule.....	7-3
<b>Section 8</b>	<b>References.....</b>	<b>8-1</b>



# TABLE OF CONTENTS

---

## List of Figures

- Figure 2-1 Site Location Map
- Figure 2-2 Geologic Cross-Section
- Figure 4-1 Remedial Action Organization Team
- Figure 7-1 Construction Schedule

## Appendices

- Appendix A Statement of Work
- Appendix B Model Health and Safety Plan
- Appendix C Drum Management Plan
- Appendix D Quality Assurance Project Plan







This Remedial Action Work Plan (Plan) was prepared on behalf of Cooper Industries, Inc. and Corning, Inc. (The Group) to serve as the basis for the overall management of the remedial action for the remedy to be implemented at the Albion-Sheridan Township Landfill (ASTL) Site. The Plan also serves to document the responsibility and authority of all organizations and key personnel involved with the implementation. This Plan has been completed to fulfill the requirements of the Unilateral Administrative Order (UAO) for remedial design/remedial action (RD/RA), U.S. Environmental Protection Agency (EPA) Docket No. V-W-96-C-316 issued October 11, 1995, that took effect on December 11, 1995.

## **1.1 PURPOSE OF THE WORK PLAN**

This Plan describes the methods to be used to complete each of the components of the RA, and has been developed in accordance with the SOW, UAO and guidance provided by U.S. EPA's Superfund Remedial Design and Remedial Action Guidance (OSWER Directive No. 9355.0-4A, June 1986). The Plan provides the objectives and the technical approach for completing tasks IV through IX outlined in the SOW, excluding those addressed by the Remedial Design Work Plan (WCC, 1996).

The Plan for the project accomplishes the following objectives:

- Serves as a management manual for the RA by establishing project-specific instructions for managing the RA.
- Defines the project team organization and the responsibilities of individual team members.
- Describes the project communication, documentation and record keeping protocols, including the use of standard forms, on-site communications, progress meetings, preparation of progress reports and organization of files.
- Identifies specific project activities, such as change orders or submittals, and describes the procedures to be used in implementation, review, approval and documentation.
- Summarizes project schedules, inspections and milestones.
- Outlines regulatory and reporting requirements

## **1.2 DOCUMENT ORGANIZATION**

The Plan has been organized into the following eight sections to fulfill the requirements outlined in the SOW:

- Section 1.0 Introduction - provides the basis, approach, and organization of the Plan.
- Section 2.0 Site Background - summarizes the information presented in the previous studies conducted at the Site.
- Section 3.0 Remedial Action Scope of Work - presents the scope of work and technical approach for completing the RA.



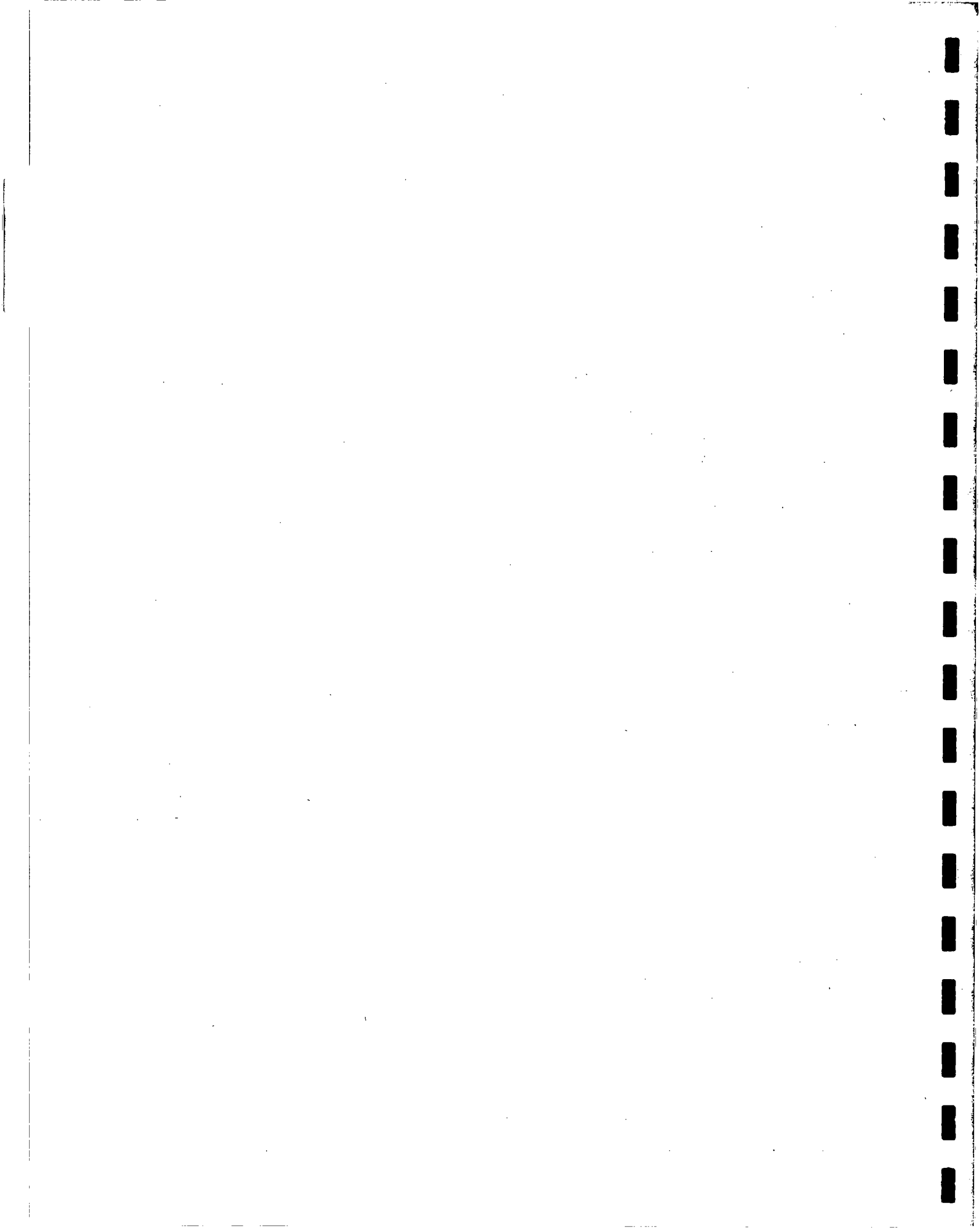


- Section 4.0      Project Organization and Management - introduces the overall organizational structure, project management, responsibilities and authority of organizations and personnel, and the technical background of key personnel involved in completing the RA.
- Section 5.0      Project Communication - describes the system, controls and procedures for review and management of project documents and communication procedures.
- Section 6.0      Project Schedule - presents the estimated time schedule for completing RA project tasks and deliverables to be submitted to the agencies.
- Section 7.0      References - presents document references.

The SOW is included in Appendix A. The RA Field Sampling Plan (FSP) has been incorporated into the Operation and Maintenance Plan and is included in Appendix D of the final design document. The model Health and Safety Plan (HASP) is included in Appendix B. The Quality Assurance Project Plan (QAPP) is included in Appendix C.







## **2.1 SITE DESCRIPTION**

The Albion-Sheridan Township Landfill Site is an inactive landfill located at 29975 East Erie Road approximately one mile east of Albion, Michigan on the eastern edge of Calhoun County (Figure 2-1). The site occupies approximately 18 acres. The site is surrounded by a combination of residential, agricultural, commercial and industrial properties. One residence is located immediately adjacent to the landfill to the south and five additional residences are located approximately 1,000 to 1,500 feet (ft) southwest of the landfill along East Erie Road. An active railroad track borders East Erie Road to the south of the landfill, and beyond the railroad tracks lies the North Branch of the Kalamazoo River. South of the river is agricultural land. The site does not fall within the flood plain of the river. There are wetlands south of the site adjacent to the river, and are not expected to be impacted by site activities.

Amberton Village housing development is located adjacent to the site on the east side, with the closest residences approximately 500 ft from the landfill. Several residences and commercial businesses are located along Michigan Avenue approximately 500 ft north of the site. Immediately west of the site is undeveloped land formerly used for agriculture. Orchard Knoll subdivision is located approximately 1,500 ft northwest of the landfill. Approximately 2,000 ft northwest of the site is a landfill associated with Brooks Foundry. Approximately one mile west is the city of Albion, with a population of 10,066 according to the 1990 census. This figure does not include approximately 1,700 students enrolled at Albion College located in the City of Albion.

### ***Landfill Characteristics***

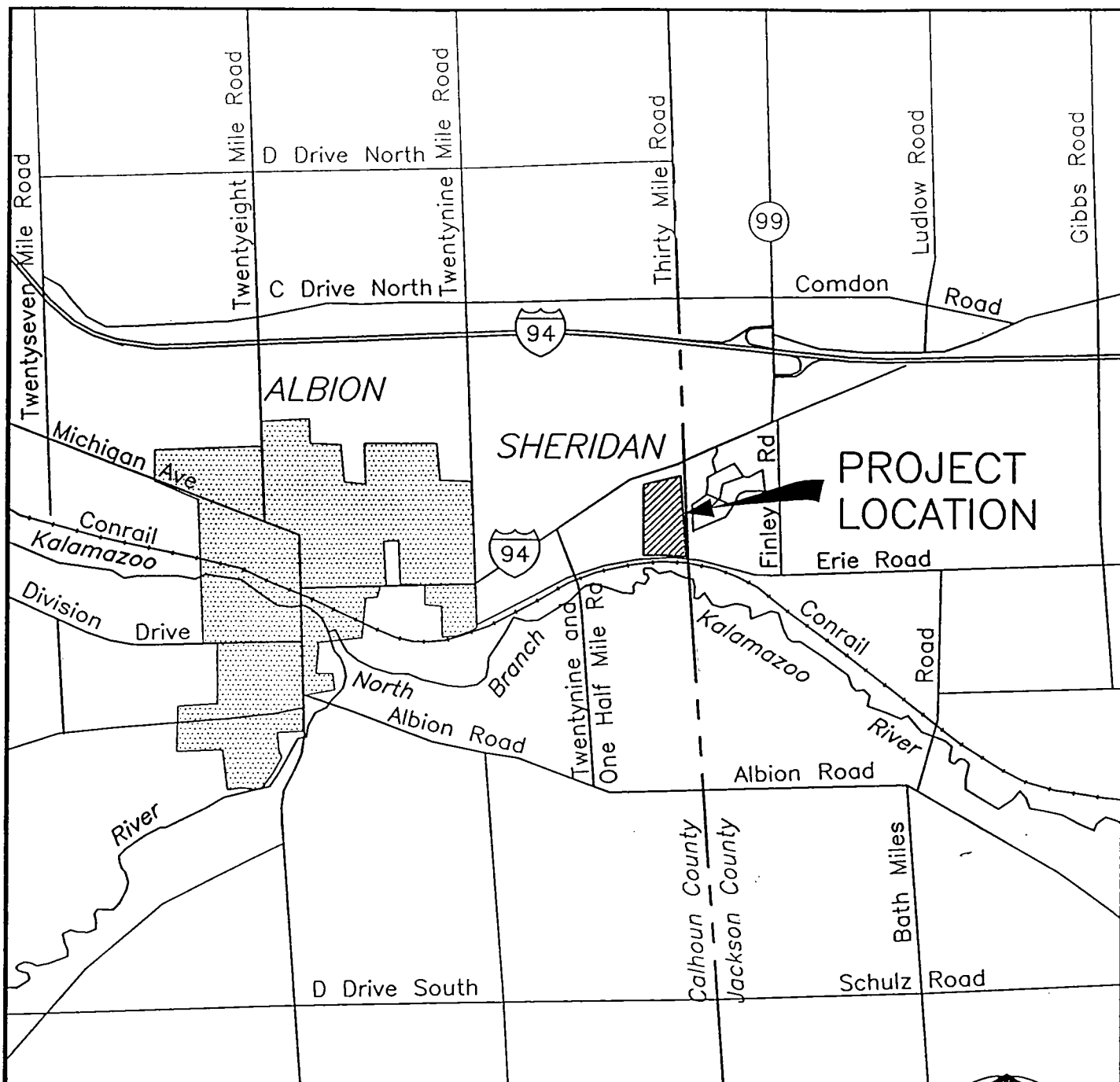
The landfill is currently covered with a 1 to 4 feet thick layer of silty sand with some gravel. The cover thickness averages approximately two feet. Refuse is present within the cover material at some locations, and includes sludge, glass fragments and insulation. Refuse material is scattered at the ground surface throughout the landfill, particularly on the slopes; this material includes metal, plastic, concrete, asphalt, 55 gallon drums, wood, tires, a storage tank, and a junk crane. The landfill surface is currently subsiding at rates of 0.04 ft to 0.13 ft per year.

The landfill ranges from 16 to 35 ft thick. During drilling of wells, refuse interlayered with medium to fine sand was encountered. Landfill gases including total VOCs at concentrations greater than 10,000 ppm were encountered during the installation of wells and subsidence monuments on the landfill. Subsurface samples contained up to 1,500 ppm total VOCs.

### ***Contaminants of Concern***

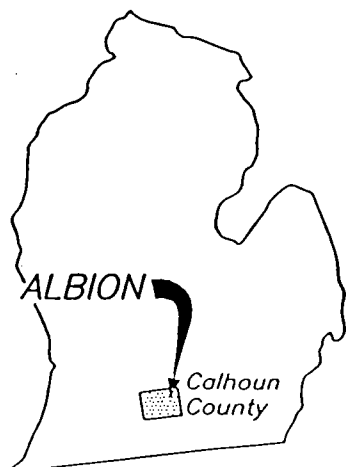
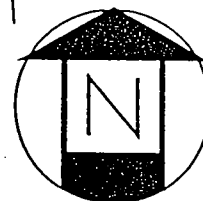
Waste samples from borings contained numerous constituents, including 10 VOCs, 19 semi-volatile organic compounds (SVOCs), and 11 pesticides/PCBs. The most concentrated compound was 4-Methyl phenol at 15 mg/kg. Several inorganic substances were present above background levels in subsurface soils, including antimony, arsenic, chromium, copper, lead, mercury and zinc. The highest concentrations include lead at 208 mg/kg, arsenic at 13.1 mg/kg and chromium at 13.5 mg/kg. Toxicity Characteristic Leachate Procedure (TCLP) metals





# VICINITY MAP

NOT TO SCALE



ALBION-SHERIDAN TOWNSHIP LANDFILL  
ALBION, MICHIGAN



**Woodward-Clyde Consultants**

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

## SITE LOCATION MAP

DRN BY: KAH

DATE: MAY 1997

PROJECT NO.

FIG. NO.

CHK'D BY: DS

DATE: MAY 1997

6E13045

2-1



analysis results indicated the presence of barium and lead in the leachate, both below hazardous waste levels.

Landfill constituents in groundwater extend southwest of the landfill for approximately 900 ft and extends vertically to a depth of approximately 45 ft below the water table. The unconsolidated aquifer plume contains 1,2-dibromo-3-chloropropane and antimony at concentrations above their respective federal Maximum Contaminant Level (MCL). The bedrock aquifer plume contains vinyl chloride at the MCL and arsenic above the MCL, at concentrations up to 126 ug/l.

### **Geology**

The geology of the site is characterized by approximately 20 to 54 ft thick glacial sediments overlying sedimentary bedrock (Figure 2-2). The glacial sediments consist of outwash sands and till, while the bedrock consists of fractured sandstone of the Marshall Formation.

Generally, the uppermost portion is composed of outwash sand from the ground surface to a depth of 10 to 30 ft below ground surface. Beneath the outwash sand is a glacial till composed primarily of silty sand with discontinuous layers containing silt and/or clay. There are no obvious clay confining layers beneath the site that are extensive enough to effectively hydraulically isolate the landfill materials from bedrock groundwater.

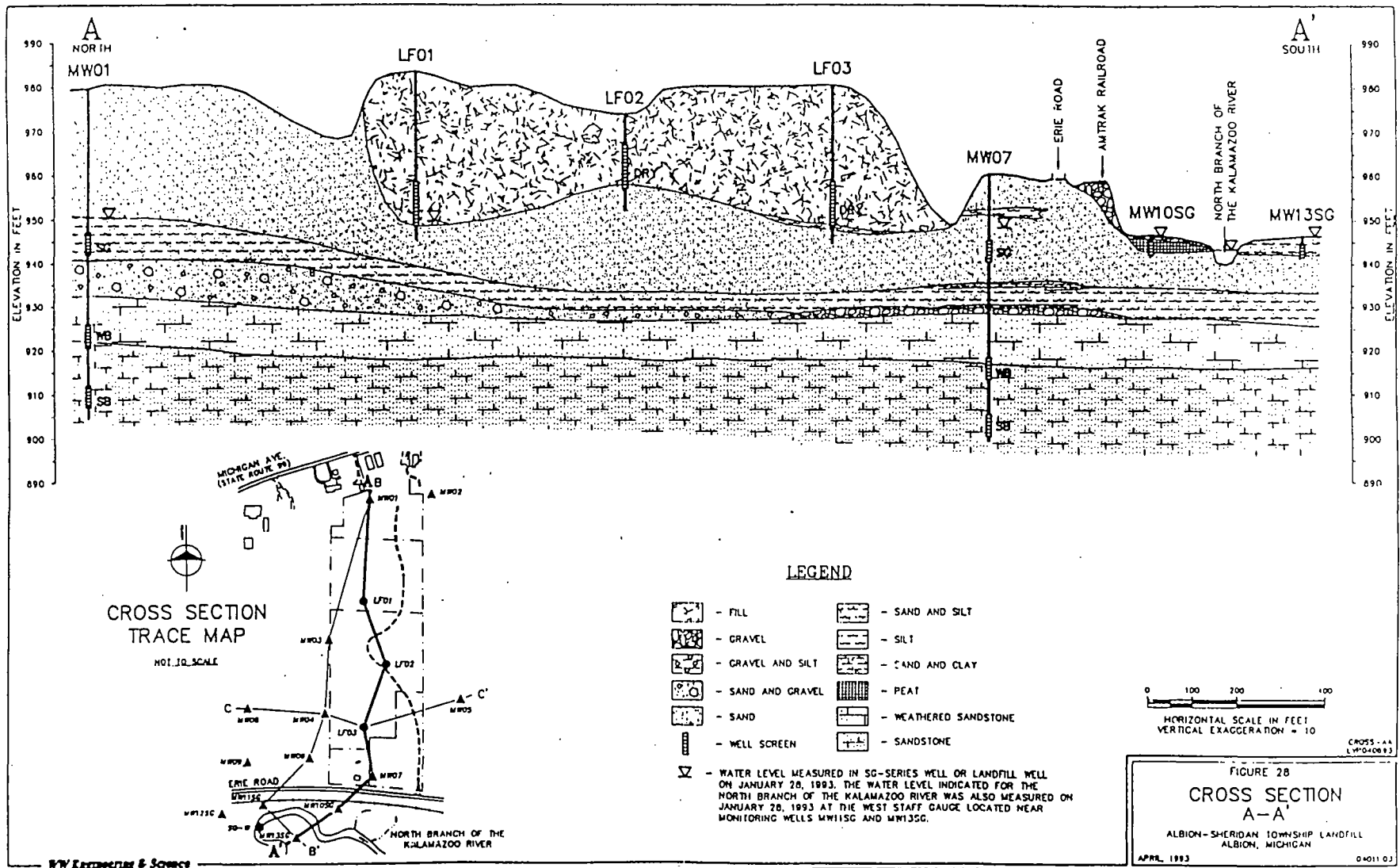
The uppermost bedrock beneath the site is comprised of Mississippian-aged sandstone of the Marshall Formation. The top bedrock beneath the site is generally encountered at an elevation of approximately 935 to 925 feet mean sea level (MSL). The uppermost portion of the sandstone (generally the upper 5 to 25 feet) is intensively weathered and very weak. Beneath the weathered portion, the rock is more competent and better cemented; however, it is still highly fractured. The sandstone is characterized by very fine to fine-grained quartz containing trace amounts of pyrite, mica and coal.

### **Groundwater**

Groundwater beneath the site is contained within the unconsolidated and bedrock aquifers. The two units are hydraulically connected in the vicinity of the site as evidenced by water level elevations. In addition, no significant clay layers or aquicludes were encountered during the drilling.

Groundwater was encountered in the unconsolidated unit throughout the site at depths of 10 to 30 feet below ground surface. Groundwater was at or very near the ground surface at the well locations adjacent to the North Branch of the Kalamazoo River. The occurrence of shallow groundwater at the site is controlled primarily by infiltration of precipitation and the characteristics of the unconsolidated unit.

The direction of groundwater flow in the unconsolidated unit is west-southwest in the vicinity of the landfill and curves in a more southerly direction near the North Branch of the Kalamazoo River. The average hydraulic conductivity of this unit was determined during the RI to be 29 ft/day. The groundwater flow velocity in the unconsolidated unit was calculated to be approximately 0.29 ft/day or 106 ft/yr.



**Woodward-Clyde Consultants**

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

CROSS-SECTION MAP FROM  
W.W. ENGINEERING & SCIENCE

DRN BY: KAH DATE: APR. 1997

CHK'D BY: DS DATE: APR. 1997

PROJECT NO.

6E13045

FIG. NO.

2-2

Comparing the water level data from both bedrock wells and unconsolidated wells indicates there is a vertical component to groundwater flow. The vertical component of groundwater flow is generally downward in the northern part of the site and upward south of the site near the river. The downward gradient suggests that the northern portion of the site is an area of groundwater recharge, and the upward gradient south of the site is consistent with groundwater discharging to the North Branch of the Kalamazoo River. In addition, there is an upward gradient in the MW04 well between the deep bedrock and the shallow bedrock. This indicates that the groundwater in the deep bedrock is discharging to the shallow and weathered bedrock aquifers, thus helping to protect the deeper groundwater from contamination.

## **2.2 SUMMARY OF PREVIOUS ACTIVITIES**

The Albion-Sheridan Township Landfill Site had been used as a sand and gravel borrow pit and also used for open, unpermitted dumping for an unspecified period of time prior to 1966. From 1966 to 1981, the landfill was privately owned and operated by Mr. Gordon Stevick. The landfill accepted municipal refuse and industrial wastes from households and industries in the City of Albion and nearby townships. In the early 1970s, the Michigan Department of Natural Resources (MDNR) approved the landfill to accept an estimated 6,000 cubic yards of metal plating sludges. Other materials, such as paint wastes and thinners, oil and grease, and dust, sand, and dirt containing fly ash and casting sand were also disposed of at the site. The sludge remain buried at the site. The landfill ceased operation in 1981.

In 1986, a U.S. EPA Field Investigation Team (FIT) contractor, performed a site screening inspection to score the site for the Hazard Ranking System (HRS). In 1988, U.S. EPA proposed that the site be included on the National Priority List (NPL), and in 1989, the site was officially placed on the NPL and designated a Superfund site.

During 1988 and 1989, a U.S. EPA technical team observed surface debris on the landfill, including drums which appeared to contain grease and paint waste. Some of the waste was classified RCRA hazardous waste for toxicity and ignitability. Some waste samples contained VOCs, including ethylbenzene, toluene, tetrachloroethylene, 1,1,1-trichloroethane, and xylene.

On March 19, 1990, the U.S. EPA issued a UAO to five potentially responsible parties (PRPs) stating that removal action was appropriate, and on May 3, 1990, the UAO was amended to delete one of the parties.

Later in 1990, two PRPs performed the removal of approximately 46 drums from the surface of the landfill. Twenty two drums were overpacked and sent to an off-site facility for incineration. The remaining 24 drums were crushed and sent to a Type 2 landfill.

In 1991, the site was selected for the presumptive remedy for CERCLA municipal landfill sites, one of the clean-up accelerating Superfund tools.

U.S. EPA initiated the RI/FS in January 1992, and the completed work reports performed by WW Science & Engineering were placed in the Administrative Record in September 1994.

On June 6-9, 1994, ABB Environmental Services, Inc. (ABB) conducted a test pitting program to assess the extent and threat to public health and the environment of drums buried within the landfill.

U.S. EPA decided on a remedial action to be implemented at the site and executed a ROD on March 1995, on which the state has given its concurrence.

On June 6, 1995, the U.S. EPA issued special notice letters to Group to initiate negotiations on a consent decree for performance of the RD/RA for the site. Group declined to enter into a consent decree to conduct the RD/RA for the site in accordance with the ROD and the SOW for the site.

The Group retained Woodward-Clyde Consultants (WCC) in March, 1996 to assist them in implementing the RD/RA. On August 2, 1996, The Group received approval from the U.S. EPA for the Remedial Design Work Plan dated June, 1996 prepared by WCC. On August 5-15, 1996, WCC conducted monitoring well installation (installing 2 of 4 monitoring wells), horizontal and vertical extent of waste verification and groundwater sampling as detailed in the Remedial Design Workplan.

On December 4, 1996, The Group received approval from the U.S. EPA for the Pre-Design Studies Report dated November, 1996 prepared by WCC.

On January 22, 1997, The Group submitted a Preliminary (30%) Design to the U.S. EPA for review.



### **3.1 PURPOSE OF SELECTED REMEDIAL ACTION**

The purpose of the remedial action at the Albion-Sheridan Township Landfill Site is to reduce the risks associated with exposure to the contaminated materials on-site, to eliminate or reduce migration of contaminants to the groundwater and to reduce the risk associated with arsenic contamination in the groundwater. The ROD describes the remedy as drum removal and the installation of a flexible membrane cap.

The remedial action was selected in accordance with two threshold criteria, overall protection of human health and the environment, and compliance with the requirements of Federal and State Applicable or Relevant and Appropriate Requirements (ARARs).

The ROD requires design and implementation of the remedial action to meet the performance standards and specifications set forth in the ROD and the SOW. Performance standards shall include clean-up standards, standards of control, quality criteria and other substantive requirements, criteria or limitations including all ARARs set forth in the ROD, SOW and/or UAO.

### **3.2 DESCRIPTION OF REMEDIAL ACTION**

#### ***Site Security***

A permanent fence shall be installed and maintained at the site to prevent access and vandalism to the site. The site security system of the landfill shall:

- Consist of a minimum 6 ft high fence, with a minimum three-strand barbed wire permanent chain link fence and gates around the perimeter of the landfill.
- Encompass at a minimum the landfill waste.
- Post warning signs at 200 ft intervals along the fence and at all gates.
- The permanent fence shall be completed within 30 days of the landfill cap completion. The warning signs shall:
  - Advise that area is hazardous due to chemicals in the soil which pose a risk to public health through direct contact with soils.
  - Provide a telephone number to be used for further information.

#### ***Restrictive Covenants/Deed Restriction***

Future development including, but not limited to, on-site excavation, construction and drilling shall be prohibited. The prohibition is achieved by filing with the Calhoun County recorder the restrictive covenants included in Appendix E of the UAO.

Institutional controls in the form of deed restrictions or a local ordinance shall be implemented 30 days after the approval of the pre-design studies report. The deed restrictions will prohibit the

installation of any groundwater well which draws drinking water from the area noted in Figure 4 of the ROD to contain 2 ug/l of arsenic or more.

All restrictions regarding future development of the landfill shall be considered permanent. U.S. EPA may advise lifting the restrictions on future groundwater drinking water well installation when the arsenic concentrations in the groundwater area described in Figure 4 of the ROD remain below the MCL for two years.

### ***Drummed Waste***

Test pit area TP09 shall be excavated to uncover all drums. Solid or liquid waste drums from TP09, nine drums previously excavated by the MDNR temporarily stored on site, and drums encountered during consolidation or site preparation determined by the drum removal contractor to be structurally sound, shall be removed to the staging area for waste characterization.

Where practical, liquid wastes from structurally unsound drums encountered at TP09 area, or during consolidation or site preparation, shall be removed and transported to the staging area for subsequent characterization.

Excavated drums showing signs of degradation shall be overpacked. The overpacked drums shall be included with the on-site overpacked drums, temporarily secured on the surface of the landfill during test pitting. Overpacked drums shall be submitted for Resource Conservation and Recovery Act (RCRA) characterization and to determine disposal options.

The ROD requires that all excavated drums containing liquid and solid wastes containing constituents in concentrations exceeding land disposal restrictions or constituents for which incineration or stabilization treatment method is prescribed to be treated or disposed off-site.

Drums containing solid wastes not banned by land disposal restrictions, may be incorporated under the ASTL cap.

### ***Landfill Cap***

The landfill cap will cover the entire landfilled waste mass as delineated in the PDR. The landfill cap will meet or exceed the substantive requirements of RCRA subtitle D (40 CFR Part 241) and any more stringent requirements of Michigan NREPA 451, 1994 Part 115 which are applicable or relevant and appropriate to the site as determined by the U.S. EPA. The multi-layer landfill cover design at a minimum will include (from the surface downward):

- **Vegetative Cover:** Native plant species will be used to establish a vegetative cover to control erosion.
- **Topsoil Layer:** The topsoil layer, which is a minimum of 6 inches (in) thick, will be placed to sustain plant growth, control erosion and promote drainage.
- **Cover Soil Layer:** The cover soil layer will be 18-in thick.
- **Drainage Layer:** The drainage layer will consist of a geonet synthetic material with a transmissivity of at least  $3 \times 10^{-5} \text{ m}^2/\text{sec}$ .

- Flexible Membrane Liner (FML): The FML will be equivalent to or less permeable than a 40 mil low density polyethylene (LDPE), or 30 mil polyvinyl chloride (PVC).
- Gas Collection Layer: The gas collection layer will consist of a 12-in. thick sand layer on top of the existing waste mass.

The following components were identified in the SOW as parts of the construction and installation activity of the landfill cap:

- Consolidating the waste on the east edge of the landfill towards the west so that the east boundary of the landfill cap and any perimeter road needed for maintenance is contained on lot 28.
- Consolidating the waste on the south edge of the landfill so that the south boundary of the landfill cap and any perimeter road needed for maintenance is contained in lot 28, parcel 3, and parcel 2 north of a line extending to the east from the north boundary of parcel 1. If lot 28 parcels 1 and 2 are acquired, waste consolidation of the south edge will not be necessary.
- Grading the landfill to attain grades and slopes required to facilitate drainage and to meet ARARs. Regrading may be used to achieve sub-cap contours. Off-site clean fill can only be employed for grading with prior EPA approval.
- Abandoning (pull casing and seal with grout), prior to construction of cap, leachate monitoring wells LF01, LF02, and LF03.
- Closing and abandoning, prior to pre-final construction inspection, monitoring wells MW-West, MW-South and MW-East. All well abandonment and closure shall be in accordance with Michigan Act 315.
- Tree removal/conservation. Where possible, existing trees outside of the landfill cap area will be preserved.

The Group has proposed technical equivalents to the ROD and SOW requirements related to grading materials, cover system materials (drain layer) and the landfill gas system (venting wells and gas collection layer). The proposed modifications are detailed in Section 3.3.

### ***Monitoring Program***

Monitoring programs will be designed and implemented to collect data in accordance with the UAO to evaluate whether the remedial action complies with specific plans. The programs consist of:

- A groundwater monitoring program to detect changes in the chemical concentration of the groundwater at and adjacent to the site following completion of the remedial action.
- An air monitoring program to detect air emissions from the landfill during and after the remedial action.



***Contingent Remedy***

A contingent remedy may be required at a later date to address groundwater. Five years after the completion of the landfill cap, a statistical test shall be completed on data from wells where the arsenic concentration has exceeded the MCL (0.05 mg/l) at any time during the monitoring period. The SOW requires a contingency remedy be implemented if:

- The statistical test results show that arsenic concentrations will not decline below 0.05 mg/l within 15 years of landfill cap completion, and/or
- The groundwater plume affected by the landfill threatens to raise arsenic concentration in a residential well that existed on the day the ROD was signed to levels above 0.05 mg/l.
- Preparation of a work plan, conducting pilot tests, designing and installing an in-situ groundwater oxidation system capable of restoring groundwater to performance standards will be required if any of the wells fail the statistical test. The contingent remedy description and requirements are further detailed in the ROD and the SOW.

The groundwater treatment system will be included in the contingent remedy and shall consist of a network of wells designed to increase oxidation of all contaminated groundwater that exceeds the MCL for arsenic to result in arsenic precipitation from the groundwater.

Groundwater treatment shall continue in each well designated for performance monitoring until the MCL performance standard for arsenic (0.05 mg/l) is attained. If no wells fail the statistical test for arsenic concentration, and the groundwater plume does not threaten residential wells, a contingent remedy will not be required; however, groundwater monitoring shall continue for at least five years following attainment of the arsenic performance standard.

**3.3 REMEDIAL ACTION SUPPORTING DOCUMENTS**

This Plan addresses the RA phase activities (SOW Tasks IV through IX). In addition, the RA includes installation of monitoring wells MW09DB and MW15SB that were not installed during the Pre-Design Studies as well as continuance of the construction materials acceptance program initiated during the preliminary design phase.

The Scope of Work (SOW) and UAO for the Albion-Sheridan Township Landfill outlines the requirements for the Plan. The Plan, by reference, includes all required supporting documents. The components of the Plan, as identified in the SOW and UAO include methodologies, plans and schedules for completion of at least the following:

- Description of the remediation and construction activities.
- Documentation of the qualifications, responsibility, and authority of all the organizations and key personnel involved with the implementation of the Plan.
- Preparation of supporting plans including quality assurance project plan (QAPP), field sampling plan (FSP), health and safety plan (HASP), and plans for additional monitoring wells.

- Schedule for the RA activities including the pre-bid meeting, bid review, and contract award.
- Identification of and satisfactory compliance with any applicable permitting requirements.
- Selection of the RA contractor.
- Implementation of a Construction Quality Assurance Plan (CQAP).
- Implementation of the Operation and Maintenance Plan (O & M Plan).
- Implementation of a Performance Monitoring Plan (PMP).
- Completion of the Contingent Remedy Groundwater Monitoring Report.

The Plan also includes the project schedule for the RA implementation that, at a minimum, establishes milestone dates for major activities and submission of deliverables generated during the RA. The schedule shall state dates of inspections, construction completion, maintenance activities, and specific dates for completion of the project.

The Plan includes the following supporting plans that have been adapted from the Pre-Design Work Plan and are attached. As discussed, the Field Sampling Plan has been incorporated into the PMP which is included in Appendix B of the Final Design document.

- |   |  |
|---|--|
| • Model Site Health and Safety Plan (HASP)<br>and Contingency Plan (CP) | Appendix B                             |
| • Quality Assurance Project Plan (QAPP)                                 | Appendix C                             |
| • Construction Quality Assurance Plan (CQAP)                            | Appendix C of Final Design<br>Document |

The Group shall use best efforts, consistent with Section XVI of the UAO, to secure site access for contractors, subcontractors, the United States and its representatives, as necessary to meet the requirements of the UAO.

### **3.4 REMEDIAL ACTION CONSTRUCTION**

The following activities shall be completed in constructing the remedial action.

#### **3.4.1 Preconstruction Inspection and Meeting**

The Group shall participate with the U.S. EPA and the MDEQ in a preconstruction inspection and meeting to:

- Review methods for documenting and reporting inspection data;
- Review methods for distributing and storing documents and reports;
- Review work area security and safety protocols;
- Discuss any appropriate modifications of the CQAP to ensure that site-specific considerations are addressed and;

- Conduct a Site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The preconstruction inspection and meeting shall be documented by a designated person and minutes shall be transmitted to all parties.

### **3.4.2 Prefinal Construction Inspection**

Within 30 days after Group make a preliminary determination that construction is complete, The Group shall notify the U.S. EPA and the MDEQ for the purposes of conducting a prefinal construction inspection. The prefinal construction inspection shall consist of a walk-through inspection of the entire Facility with U.S. EPA and the MDEQ. The inspection is to determine whether the project is complete and consistent with the Contract Documents. Any outstanding construction items discovered during the inspection shall be identified and noted. Additionally, treatment equipment, if any, shall be operationally tested by The Group. The Group shall certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting shall be completed where deficiencies are revealed.

### **3.4.3 Final Construction Inspection**

Within 15 days after completion of any work identified in the prefinal construction inspection report, The Group shall notify the U.S. EPA and the MDEQ for the purposes of conducting a final construction inspection. The final construction inspection shall consist of a walk-through inspection of the Facility by U.S. EPA and MDEQ and The Group. The prefinal construction inspection report shall be used as a checklist with the final construction inspection focusing on the outstanding construction items identified in the prefinal construction inspection. At the final construction inspection, The Group shall confirm that outstanding items have been resolved.

### **3.4.4 Prefinal Construction Inspection Report**

Within 15 days of the prefinal construction inspection, The Group shall submit a Prefinal Construction Inspection Report which outlines the outstanding construction items, actions required to resolve outstanding items, and includes a proposed date for the final construction inspection. The Prefinal Construction Inspection Report may be submitted in the form of a punch list or a letter.

### **3.4.5 Final Construction Report**

Within 30 days of a successful final construction inspection, The Group shall submit a Final Construction Report. In the report, a registered professional engineer and The Groups' Project Coordinator shall state that the Remedial Action has been constructed in accordance with the design and specifications. The Final Construction Report shall contain the following statement, signed by a responsible corporate official of The Group or The Groups' Project Coordinator:

*"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am*

*aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

The final construction report shall include, but not be limited to, the following elements:

- Chronology of events
- Summary of Construction Quality Assurance and Quality Control
- Summary of construction activities
- Summary of final construction inspection
- As-built drawings signed and stamped by a professional engineer
- Explanation of any modifications to the Remedial Design and why these were necessary for the project
- Certification that the remedy is functioning properly and is performing as designed
- Explanation of operation and maintenance, including monitoring, to be undertaken at the site and any changes required based on modification of site plans during construction
- Certification of the design and construction

### **3.5 CONTINGENT REMEDY**

If so directed by U.S. EPA, in consultation with the MDEQ, The Group shall implement all tasks applicable to the contingent remedy, as specified on pages 26 through 28 of the ROD.

#### **3.5.1 Contingent Remedy Groundwater Monitoring Report**

No earlier than 58 months and no later than 60 months following The Groups' submittal of the final construction report, The Group shall submit a Contingent Remedy Groundwater Monitoring Report. This report shall include results of a statistical test on each monitoring well in which the arsenic concentration exceeded 0.05 mg/l during any sampling event. For each such well, The Group shall submit a time plot of arsenic concentrations over the five year period. For those wells at which a downward trend is present, The Group shall use a regression, time series, or other model approved by U.S. EPA, to predict the date at which arsenic concentrations will meet 0.05 mg/l arsenic, assuming that the observed trend continues. If the data do not exhibit serial correlation, The Group shall use a regression model to estimate a linear or nonlinear trend for the subset of data which represent a downward trend. If the data do exhibit serial correlation, The Group shall use a time series model in lieu of a regression model on the same subset of data. Another method may be used if approved by U.S. EPA.

#### **3.5.2 Work Plan, Pilot Testing, and Design of Groundwater Treatment System**

Within 60 days after notification from U.S. EPA that the contingent remedy must be implemented, The Group shall submit a Work Plan for Groundwater Treatment. The plan shall

document the overall management strategy for performing the pilot testing, design, construction, and operation of the treatment system, for U.S. EPA review and approval. The plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation and shall include a description of qualifications of key personnel, including contractor personnel.

The Work Plan for Groundwater Treatment also must include the following items:

- Detailed plans for pilot testing and a schedule for submittal of a Pilot Testing Report for Groundwater Treatment;
- A schedule for submittal of Preliminary and Final Design for Groundwater Treatment;
- Preliminary schedule for a pre-construction meeting, pre-final and final inspections, Completion of Construction Report, and Completion of Work Report;
- Plans and schedule for selection of contractor; and
- Construction schedule, including completion of construction.

The Work Plan for Groundwater Treatment shall also include any necessary updates to the approved Quality Assurance Project Plan (QAPP), Site Health and Safety Plan, and Field Sampling Plan. The plan shall also include any additional plans for site access which are necessary for the contingent remedy.

Upon U.S. EPA approval of the Work Plan for Groundwater Treatment, The Group shall conduct Pilot Studies to determine whether air or another oxidant is most suitable for the site and to assist with design of the system. The Group shall submit a Pilot Studies Report, a Preliminary Design and a Final Design within the schedule approved in the Work Plan.

The Preliminary and Final Design shall include each of the items listed under Task 3 of this SOW, unless notified in writing by U.S. EPA that certain elements are not necessary.

### **3.5.3 Construction of Groundwater Treatment Systems**

Within 90 days of U.S. EPA approval of the Final Design, The Group shall award contract(s) for the groundwater treatment system. The Group shall initiate and complete construction of the groundwater treatment system within the schedule approved in the Work Plan for Groundwater Treatment.

Upon completion of construction of the groundwater treatment system, The Group shall complete each of the items listed under Task V as they apply to the groundwater treatment system, including notification of U.S. EPA for pre-final and final construction inspections and submittal of pre-final and final construction reports.

### **3.6 REMEDIAL ACTION COMPLETION**

#### **3.6.1 Completion of Remedial Action**

After receiving notice from U.S. EPA that either a) the contingent remedy will not be invoked, or b) a petition to cease operation of the groundwater treatment system has been approved, The Group shall assess the Remedial Action to determine whether all performance standards have been attained. Within 90 days of The Groups' assessment that performance standards have been attained and Remedial Action is fully performed, except for long-term groundwater monitoring and operation and maintenance of the landfill, The Group shall notify U.S. EPA and the MDEQ for the purpose of conducting a pre-certification inspection for completion of remedial action.

Within 30 days of a successful final inspection, The Group shall submit a Completion of Remedial Action Report. The written report shall include as-built drawings signed and stamped by a professional engineer for any construction changes or any construction not included in the Final Construction Report. The Completion of Remedial Action Report shall contain the following statement, signed by a responsible corporate official of The Group or The Groups' Project Coordinator:

*"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

#### **3.6.2 Completion of Work**

Within 90 days of The Groups' assessment that all phases of work at the site are complete, except for long-term operation and maintenance of the landfill, The Group shall notify U.S. EPA and the MDEQ for the purpose of conducting a pre-certification inspection for completion of work.

Within 30 days of completion of all groundwater monitoring required by the ROD, UAO and this SOW, The Group shall submit a Completion of Work Report. In the report, a registered professional engineer and The Groups' Project Coordinator shall state the Remedial Action has been completed in full satisfaction of the requirements of this UAO. The written report shall include as-built drawings not previously submitted, signed and stamped by a professional engineer. The report shall contain the statement listed under Section 3.7.1 above.

### **3.7 MATERIALS ACCEPTANCE**

The materials acceptance program is a continuation of the program initiated during the pre-design phase. The objectives of the materials acceptance program are to expedite initiation of material delivery and cap construction. Based on WCC's experience at similar sites, the characteristics of fill materials (drainage sand, cover fill, and topsoil), FML and their testing requirements can be specified and sources of these materials can be verified prior to construction.

## **SECTION THREE**

## **Remedial Action Scope of Work**

---

The program will include: 1) submitting and obtaining agency approval of key material specifications, 2) obtaining preliminary material test results and price information from suppliers, 3) selection of suppliers and additional test results to finalize selections, and 4) finalize purchase agreements with suppliers.





A Project Coordinator has been assigned by The Group for this RD/RA project. WCC will provide the Project Coordinator who will serve as the main point of contact with the U.S. EPA Remedial Project Manager (RPM) and will be responsible for the direction and supervision of all work performed pursuant to the UAO.

WCC has been selected as the Design Engineer and is assigned to carry out the responsibility for the design phases of the RA.

The project organization chart detailing the management structure is presented in Figure 4-1 and includes the names of the key personnel in-charge of the components of the project. A summary of each key personnel's responsibilities is presented below:

***Project Coordinator, John Seymour, P.E. (WCC)***

- Point of contact for U.S. EPA RPM and MDEQ project manager
- Supervision of all RD/RA work
- Ensures that requirements of UAO have been fulfilled

***Design Engineer***

The Design Engineer's staff will consist of:

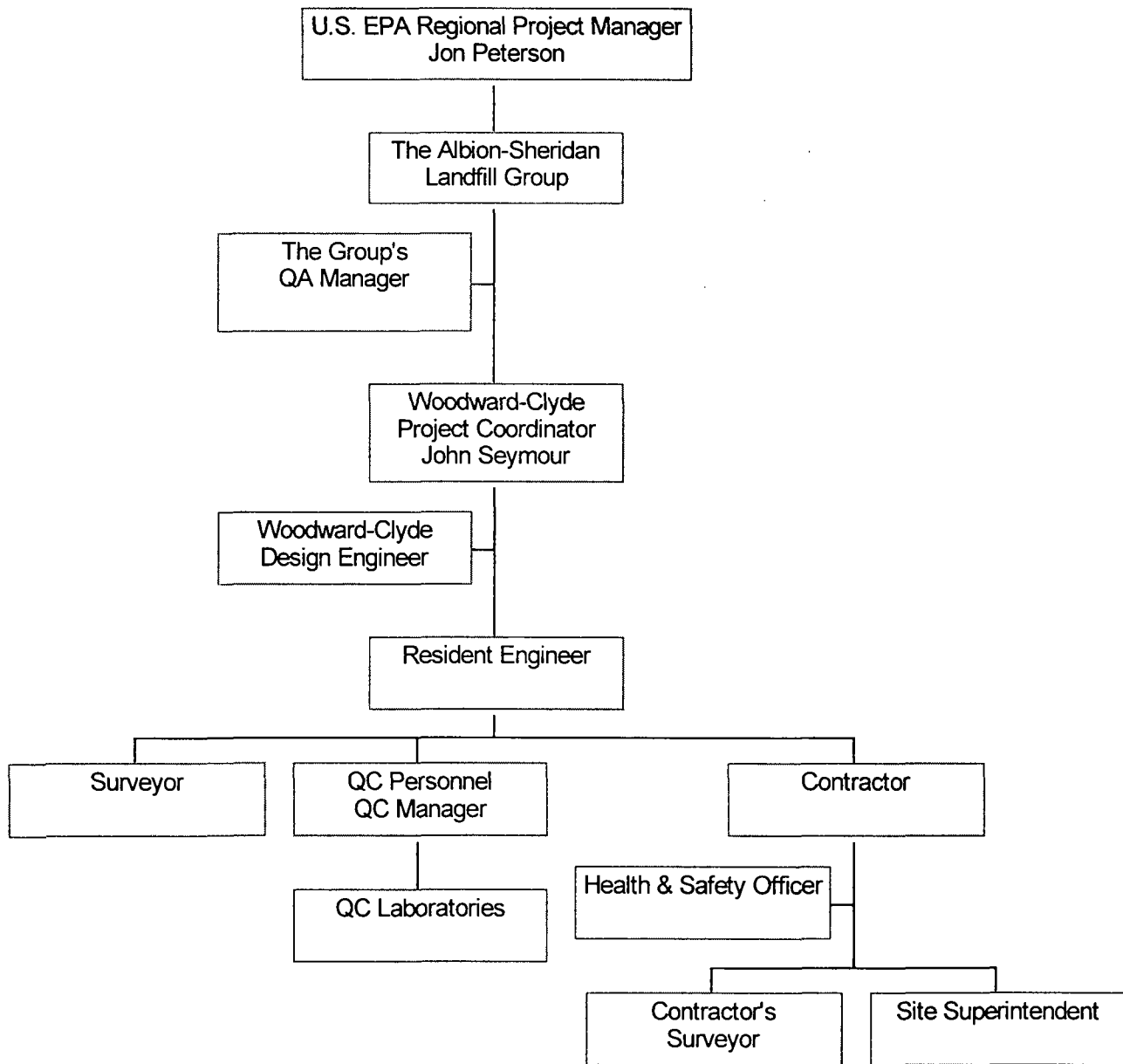
Project Manager, Robert Gibson

- Provide project management and coordinate RD activities
- Ensure RD/RA activities are completed within budget and on schedule
- Ensure appropriate resources are available as required for the project
- Provide technical review and support as required during discussions with U.S. EPA
- Liaison between the engineer's team and The Group Representative
- Ensure professional services are of highest quality
- Conduct overall project review performance
- Provide overall project QA/QC review and management oversight

Design Manager, Larry Haukos

- Responsible for providing design services for civil engineering aspects of the RD/RA
- Participate in key technical discussions and negotiations with U.S. EPA, as needed
- Manage on-site design-related activities, as needed
- Participate in key technical discussions and negotiations with U.S. EPA as needed
- Review construction material specifications

FIGURE 4-1  
PROJECT ORGANIZATION TEAM  
ALBION-SHERIDAN TOWNSHIP LANDFILL  
CONSTRUCTION QUALITY ASSURANCE PLAN



Health & Safety Officer

- Health and safety requirements for submittal of necessary plans for RA
- Monitor implementation of the health and safety plan during RA
- Monitor whether site personnel have necessary health and safety training

Surveyor

- Provide ground control surveying
- Survey additional monitoring wells

The Management Structure (Figure 4-1) illustrates the lines of responsibility and communication between the various project team members. The project team members will be appointed based on their professional qualifications applicable to their responsibilities, training and experience working with similar remedial actions. The project team will include representatives of The Group, U.S. EPA, MDEQ, the Project Coordinator, the Engineer, the Construction Contractor, and the Operation and Maintenance (O&M) Manager. The Engineer has overall responsibility for construction oversight at the site.

## **4.1 RESPONSIBILITY**

### **4.1.1 Project Coordinator**

The Project Coordinator has the responsibility for implementing the RA, coordinating all phases of the construction and the O&M activities, and all communication with the project team. As a part of these responsibilities, the Project Coordinator has the authority to accept or reject plans and specifications for the RA, the implementation plans, the reports, the materials and the workmanship of the Contractor(s).

### **4.1.2 U.S. EPA Project Manager**

U.S. EPA is responsible for the Agency oversight and management of the ASTL Remedial Action tasks and has designated Mr. Jon Peterson as the U.S. EPA Remedial Action Project Manager. Mr. Peterson will be responsible for document submittal review, document approval, agency field oversight and agency project coordination.

### **4.1.3 Engineer**

The Engineer will have qualifications that demonstrates successful experience with RA projects. The Engineer will appoint a Resident Engineer who will act as the representative of the Engineer in the day-to-day operation of constructing the landfill cap.

The Engineer will report to the Project Coordinator and will have the overall responsibility for inspection of construction, O&M activities, and fulfilling the requirements set forth in the Contract Documents. The Engineer is also responsible for obtaining all necessary approvals from agencies and consultants responsible for the RA prior to the release of technical changes to

the Contract Documents. The Engineer will receive and review construction submittals prepared by the Construction Contractor.

The Engineer's responsibilities include the following:

- Communications with Contractors
- Project planning activities and schedules
- Attending progress meetings
- Communicating with all key personnel
- Coordinate Construction Quality Assurance (CQA) activities
- Authorize modifications to the Contract Documents
- Issue a certificate of substantial completion
- Issue a letter of final acceptance

The Engineer may delegate his duties to other project team members; however, he will retain the overall responsibility, the authority, and will continue to be the central person responsible for project management duties.

#### **4.1.4 Resident Engineer**

The Resident Engineer will be responsible for project management as directed by the Engineer during cap construction. These project management duties could include the following:

- Serve as the Owner's and Engineer's liaison with the construction contractor
- Conduct the preconstruction meetings
- Verify that construction Contractor maintains adequate records
- Implement a project filing system
- Maintain logbooks
- Receive, distribute and review all written communications
- Prepare daily and weekly progress reports and assist with monthly progress reports
- Review and recommend periodic requests for payment from the Contractor
- Recommend change order authorizations to The Group
- Issue field orders after approval by The Group
- Verify that items are installed as shown on approved shop drawings
- Maintain a shop drawing log
- Attend weekly progress meetings
- Prepare a list of items required for final acceptance before substantial completion
- Attend the prefinal inspection

- Assist in the preparation of and review the prefinal inspection report
- Attend the final inspection

#### **4.1.5 Design Engineer**

The Design Engineer, a designee of The Group, will be responsible for providing technical assistance to the Project Coordinator, the Engineer and the Resident Engineer. The Design Engineer's responsibilities will include the following:

- Assist the Engineer in understanding the intent of the Contract Documents
- Conduct periodic on-site observations
- Verify that O&M procedures are conducted as required by the Contract Documents and the manufacturers' instructions
- Provide recommendations to the Engineer regarding any suggestions provided by the Contractor
- Verify that construction is accomplished as shown on approved Drawings

#### **4.1.6 Site Health and Safety Officer**

The Site Health and Safety Officer will be employed by the Contractor. This person will be responsible for ensuring that all health and safety requirements presented in the Contractor's Health and Safety Plan are met.

#### **4.1.7 Quality Assurance Officer**

The construction Quality Assurance (QA) Officer, a designee of The Group, will be an individual or a firm experienced with CQA activities for remedial action sites. The QA Officer, or his designee, will be responsible for implementing the CQAP, making revisions to the plan, coordinating CQAP activities and documenting that the plan's goals have been accomplished. The QA Officer will perform the tasks assigned as described in the CQAP.

#### **4.1.8 QA Surveyor**

The QA Surveyor will be a professional engineer or land surveyor registered in the State of Michigan. The QA Surveyor, contracted to The Group and independent of the Contractor's surveyor, will perform Measurement and Payment surveys as required by the Engineer and perform QA auditing and/or verification of the construction survey work performed by the Contractor's Surveyor. The QA Surveyor shall provide certification that the work completed as part of the landfill component was constructed to the lines and grades indicated on the as-built drawings. The QA Surveyor will work under the direction of the Engineer and QA Officer.

**4.1.9 Contractor(s)**

The construction Contractor and O&M Contractor will provide skilled labor, operators, engineers, draftsmen, surveyors, and technicians experienced with RA work. These Contractors will perform the work described by the RA and the Contract Documents. The Project Team organization and responsibilities for the O&M activities are described in the O&M - QAPP document.

The O&M Contractor will designate an O&M Project Manager. The O&M Manager will possess the technical resources to accomplish specific tasks associated with all O&M activities. The O & M Project Manager will report directly to The Group.

**4.1.10 Community Relations**

Community relations will be coordinated and implemented by the U.S. EPA in consultation with the MDEQ. The Group and the Engineer will participate in preparation and dissemination of technical information to the public or for use in public meetings held or sponsored by U.S. EPA or MDEQ to explain activities at the Site. All community relations support will be consistent with the Superfund Community relations policy as stated in the "Guidance for Implementing the Superfund Program" and "Community Relations in Superfund - A Handbook."

Representatives of The Group and the Engineer will be available, if requested, to attend public meetings along with U.S. EPA and MDEQ representatives.



The following sections address the system, controls, and procedures for the review and management of project documents. Daily communication and administration procedures during construction at the construction site are the responsibility of the Resident Engineer (RE). The RE will implement and maintain these procedures and issue instructions for compliance with the RA. The Engineer may delegate specific authority to other team members; however, the RE will obtain the Engineer's approval for all revisions to the RA.

During O&M activities, communication and administrative procedures will be the responsibility of the O&M Contractor's Project Manager.

## **5.1 CORRESPONDENCE CONTROL**

All correspondence concerning the RA will originate from, or be directed through, the Engineer, the O&M Manager or their designee. During construction, the Resident Engineer will receive this information. Documentation of facsimiles, letters, telephone calls and meetings is described in the following subsections.

### **5.1.1 Incoming Correspondence**

All Contractor correspondence regarding the construction project will be directed to the attention of the Engineer, the O&M Manager or their designee. Correspondence will be stamped with the date it was received, and then copied and distributed to the appropriate personnel; a copy will also be placed in the project file.

### **5.1.2 Outgoing Correspondence**

All letters, reports, meeting minutes, quality assurance/quality control (QA/QC) tests will be sent to the Resident Engineer, during construction, for distribution, review and approval. The approved documents will be distributed and a copy placed in the project file. The Resident Engineer will be responsible for distributing all outgoing documents.

### **5.1.3 Distribution and File Copy Protection**

Distribution of documents will be limited to those individuals identified in the Team Organization Chart; other distribution will be approved by the Project Coordinator. Security of the project file will be the responsibility of the Resident Engineer during construction and then the O&M Manager during the post construction period. The location, security method and access protocols will be determined by the Resident Engineer, or O&M Manager, in a way to maintain the integrity of the file.

### **5.1.4 Facsimiles and Letters**

Facsimiles will be used for rapid written communication. The Engineer during construction, and the O&M Manager during O&M activities will review any incoming or outgoing correspondence. Copies of appropriate correspondence will be distributed to the designated personnel. Incoming facsimiles will be photocopied, distributed as described in Section 4.1.2, and filed with the cover



sheet in the project file. Outgoing facsimiles will be routed by the Resident Engineer or O&M Manager, transmitted to the receiving party, and then placed with the cover sheet in the project file.

### **5.1.5 Telephone Conversations**

To ensure that information sent or received by telephone is documented, a Record of Telephone Conversation will be completed (and distributed, if appropriate) and placed in the project file. Formal letters of confirmation as required on important and sensitive topics, will be directed to the Project Coordinator for approval prior to distribution.

## **5.2 MEETINGS**

Meeting Agendas will be prepared by the Engineer or by the O&M Manager. Progress meetings will address the issues identified in the daily and weekly reports, as well as weekly scheduling and health and safety issues. The Engineer and the O&M Manager (or their designee) will preside at all meetings. A person designated by the Project Coordinator will prepare the meetings minutes, submit them for review by the Project Coordinator, and provide for their distribution after approval. The meeting minutes will be distributed in accordance to a predetermined distribution list, as soon as possible after the meeting. Action items will be clearly noted, decisions will be documented, responsible individuals will be identified and a scheduled response date will be recorded. If approval of specific items is required, these items will be identified with the required response date. The record of the meeting minutes will be considered to be approved as written unless specific comments or disapproval's are provided by the Engineer, the O&M Manager, or the Contractor within five working days after distribution. A copy of the meeting minutes will be placed in the project file.

All meetings with the Contractor or any subcontractor will be arranged at the discretion of the Engineer or the O&M Manager. All concerned persons will be notified in sufficient time to prepare for the meeting.

### **5.2.1 Preconstruction Inspection/Meeting**

A meeting and site inspection will be held prior to the start of construction to resolve any uncertainties following the design completion and the construction contract award. The meeting will be held at a location convenient for all parties, as designated by the Project Coordinator.

### **5.2.2 Progress Meetings**

Regularly scheduled progress meetings will be held at the site field office or the Project Coordinator's office. During construction, the progress meetings will be held every 14 days, with the first meeting one week after the preconstruction meeting or within one week after the date of the Notice to Proceed. The Project Coordinator may call for additional meetings as necessary. Personnel recommended to attend these meetings and the suggested agenda are summarized in the Contract Documents.

**5.2.3 Problem/Deficiency Meetings**

A problem/deficiency meeting (or telephone conference call) shall be conducted when a problem or deficiency is present or anticipated. The purpose of a problem/deficiency meeting is to define and resolve a concern at the site. The meeting will be held at the project field office of the Contractor. The QA Officer, or designee, shall document and distribute minutes of problem/deficiency meetings. A detailed description of the problem/deficiency meetings are provided in Section 01039 of the Contract Specifications.

**5.2.4 Prefinal Inspection/Meeting**

The Resident Engineer will notify, the Project Coordinator, The Group, U.S. EPA, MDEQ, and the Contractor for the purposes of conducting a prefinal inspection at 99% construction completion. The objectives of the prefinal inspection are described in Section 3.4.2 of the RA. The inspection will consist of a walk-through evaluation of the entire project.

The Prefinal Construction Inspection Report will be prepared by the Resident Engineer and the QA Officer for submittal to USEPA and MDEQ within fifteen (15) days after the prefinal inspection. This report will outline the outstanding construction items, the actions identified to resolve the outstanding construction items, the completion date(s) for the construction items, and the date for the final inspection.

**5.2.5 Final Inspection/Meeting**

The Resident Engineer will notify the Project Coordinator, The Group, U.S. EPA, MDEQ, and the Contractor for the purposes of conducting a final inspection after the outstanding construction items have been completed and within fifteen (15) days of completion of construction. The final inspection will consist of a walk-through evaluation of the project. The Prefinal Inspection Report will be used as a checklist for the final inspection, with emphasis placed on outstanding construction items identified in the prefinal inspection.

Following the final inspection, the Resident Engineer and QA Officer will prepare a draft Final Construction Report for submittal to USEPA and MDEQ. Details concerning this report are provided in Section 3.4.5.

A person will be designated to document the Prefinal and Final Inspection meetings. The meeting minutes will be distributed to the appropriate agencies, the consultants, the Contractor and a copy will be placed in the project files.

**5.3 QUALITY ASSURANCE/QUALITY CONTROL****Construction**

The QA/QC documents that will be prepared during construction activities will include:

- Monthly CQA reports prepared by the QA Officer for review by the Engineer
- Weekly CQC reports prepared by the Contractor to assist the QA Officer in preparation of the CQA reports.

- Memoranda prepared by the QA Officer documenting construction problems, deficiencies, and resolutions discussed during meetings.

These memoranda and all supporting data sheets, along with test results and the QA Officer's approval of the work, will be compiled by the QA Officer. These documents will be included in the Final Completion of Remedial Action Report. Additional details of required CQA reporting are provided in the CQA Plan and the Contract Documents.

#### Operation and Maintenance

During O&M, the O&M Manager will prepare periodic QC reports on the accuracy, precision and completeness of monitoring analytical data. These QC reports will also include results of any inspections and summarize any corrective actions needed or taken during O&M activities.

These QC reports will be included in progress reports prepared by the Project Coordinator for submittal to the regulatory agencies and The Group. Additional requirements for O&M QA/QC reporting are provided in the Quality Assurance Project Plan (QAPP) found in Appendix C.

### **5.4 PROGRESS REPORTS**

The Project Coordinator will provide USEPA, MDEQ, and The Group with progress reports. The progress reports will contain the following information as a record of events for each reporting period:

- A description and estimate of the percentage of the RA work completed
- All findings and results of sampling or testing during the reporting period
- A description of the actions undertaken to comply with the UAO during the prior month
- Summaries of changes made in the RA during the reporting period along with the U.S. EPA approval for the changes
- Summaries of the contacts with representatives of the local community, public interest groups and/or state government during the reporting period
- Summaries of all problems or potential problems, actual or anticipated delays encountered during the reporting period
- Actions being taken to rectify the problems or delays
- Changes in personnel during the reporting period
- Projected work for the next 90 days with schedules relating such work to the overall project schedule for RA completion
- Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

The progress reports will be signed by the Project Coordinator. Monthly progress reports will be submitted to the U.S. EPA and MDEQ on or before the 10th day of each month following the effective date of the UAO, during the RD/RA activities. Submittal of progress reports shall continue until U.S. EPA gives a written notice.

### **5.5 STORAGE OF RECORDS**

All originals will be stored by the Engineer during construction, or the O&M Manager during O&M activities in a safe repository on site during construction. Other reports may be stored by any standard method which will allow for easy access. All records will be preserved in accordance with the required retention period specified in the UAO. Following construction, all records will be retained off-site by the Project Coordinator (or his designee).

### **5.6 FINAL CERTIFICATION**

A CQA Final Certification will be prepared. The certification will include all pertinent documents prepared and compiled by the CQA Officer that summarizes the construction QA/QC and CQA Plan activities of the project. The certification will also verify that construction was completed in substantial compliance with the project Plans and Specifications, and the CQA Plan. The CQA Final Certification will become part of the Final Completion of Remedial Action Report. Items to be included in the final certification are identified in the CQA Plan. The certification will include the following statement which will be signed by the Project Coordinator for The Group:

*"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

### **5.7 SITE VISITS**

All requests for site visits by non-project personnel will be submitted to the Project Coordinator or his designee for his approval. All representatives of product manufacturers will be approved by the Project Coordinator prior to their participation in the installation and startup tasks. All visitors to the site will be required to comply with the requirements of the site Health and Safety Plan.

### **5.8 SITE PHOTOGRAPHS**

The Contractor is required to photo-document the construction activities as part of their contract duties. A copy of all photographs and the associated photo logs must be given to the Engineer for inclusion in the project file.

### **5.9 REQUESTS FOR INFORMATION**

All requests for information by parties other than the Contractor regarding the construction project must be approved by the Project Coordinator. However, the construction Contractor's superintendent may release information required to facilitate the construction (to subcontractors) without the approval of the Engineer or the Project Coordinator or his/her designee. No other type of information may be released to outside sources by any other project personnel. All requests for information shall be submitted on a Request For Information Form.



**6.1 CONSTRUCTION PERMITS**

Permits required for the construction phase, relevant agencies and contact names include, but not limited to:

Permit	Agency and Contact Name
Soil Erosion and Sediment Control	Calhoun County Road Commission Contact: Ms. Carol Tabiaddon (517) 629-2614 or (800) 781-5512
Use of City Road Right-of-Way	Calhoun County, Permit Division Contact: Mr. Richard Walsh (517) 629-2614
Construction and Tree Removal	Sheridan Township, Building Official Contact: Mr. Harry Arquette (517) 629-2604

A copy of these permits, and any other permits required during the project will be provided to the Engineer.



}

This Section describes the preparation, identification, and maintenance of the reporting requirements to document that the remedial action is in conformance with the UAO. The schedule for receiving the various plans and reports is included in the SOW and is summarized below.

## **7.1 PROJECT DELIVERABLES**

Upon completion of the pre-final and final design phases, one or more copies of each of the design reports will be submitted to the following for comments.

Christopher Smith  
Cooper Industries  
P.O. Box 4446  
Houston, Texas 77210  
Phone: 713/739-5618  
Fax: 713/739-5881

John Seymour  
Woodward-Clyde Consultants  
28777 W. Six Mile Road  
Suite 200  
Livonia, Michigan 4852

John (Jack) Gray  
Corning Incorporated  
Environmental & Engineering Services  
HP-ME-03-055-B12  
Corning, New York 14831  
Phone: 607/974-6399  
Fax: 607/974-6119

Jon Peterson  
U.S. EPA - Region V  
Waste Management Division  
77 W. Jackson Blvd. - SR-6J  
Chicago, Illinois 60604  
Phone: 312/886-4696  
Fax: 312/886-4071

Elizabeth Bartz  
Earth Tech  
P.O. Box 874  
Grand Rapids, Michigan 49588  
Phone: 616/942-9600  
Fax: 616/942-6499

Kim Sakowski  
MDEQ - Knapps Building  
Environmental Response Division  
301 S. Capitol  
Lansing, Michigan 48933  
Phone: 517/335-3391  
Fax: 517/335-4887

Bob Gibson  
Woodward-Clyde Consultants  
Park Place West Building  
6465 Wayzata Blvd, Suite 660  
Minneapolis, Minnesota 55427  
Phone: 612/593-5650  
Fax: 612/593-0094

Comments will be incorporated into the final reports. To facilitate review, a brief written response to comments indicating that the requested changes were made (and where) or an explanation as to why the changes were not made will be included with the final reports. The schedule required by the SOW is presented in Figure 7-1. The following list identifies design submittals and their schedule for completion:



## SECTION SEVEN

## Project Schedule

Award Construction Contract(s)	Thirty (30) days after approval of RA Work Plan
Pre-Construction Inspection and Meeting	Fifteen (15) days after Award of RA Contract(s)
Initiate Construction of RA	Fifteen (15) days after Pre-Construction Inspection and Meeting
Completion of Construction	As approved by U.S. EPA in RA Work Plan
Prefinal Construction Inspection	Thirty (30) days after Group' assessment that construction is complete
Final O&M Plan	No later than Prefinal Construction Inspection
Prefinal Construction Inspection Report	Fifteen (15) days after Prefinal Construction Inspection
Final Construction Inspection	Fifteen (15) days after completion of work identified in Prefinal Construction Inspection Report
Final Construction Report	Thirty (30) days after Final Construction Inspection
Contingent Remedy Groundwater Monitoring Report	58 to 60 months after Group' submittal of Final Construction Report
<b>The following items will be due only if the Contingent Remedy is required:</b>	
Work Plan for Groundwater Treatment	Sixty (60) days after notice that Contingent Remedy is required
Pilot Studies Report for Groundwater Treatment	As approved in Work Plan for Groundwater Treatment
Preliminary Design for Groundwater Treatment	As approved in Work Plan for Groundwater Treatment
Final Design for Groundwater for Treatment	As approved in Work Plan for Groundwater Treatment
Award RA Contract for Groundwater Treatment	Ninety (90) days after U.S. EPA approval of Final Design
Initiate/Complete Construction	As approved in Work Plan for Groundwater Treatment
Construction Inspections and Construction Reports for Groundwater Treatment	As specified in Task 5 of this SOW
Pre-certification Inspection for completion of RA	Ninety (90) days from Group' assessment that Remedial Action is fully performed and performance standards attained

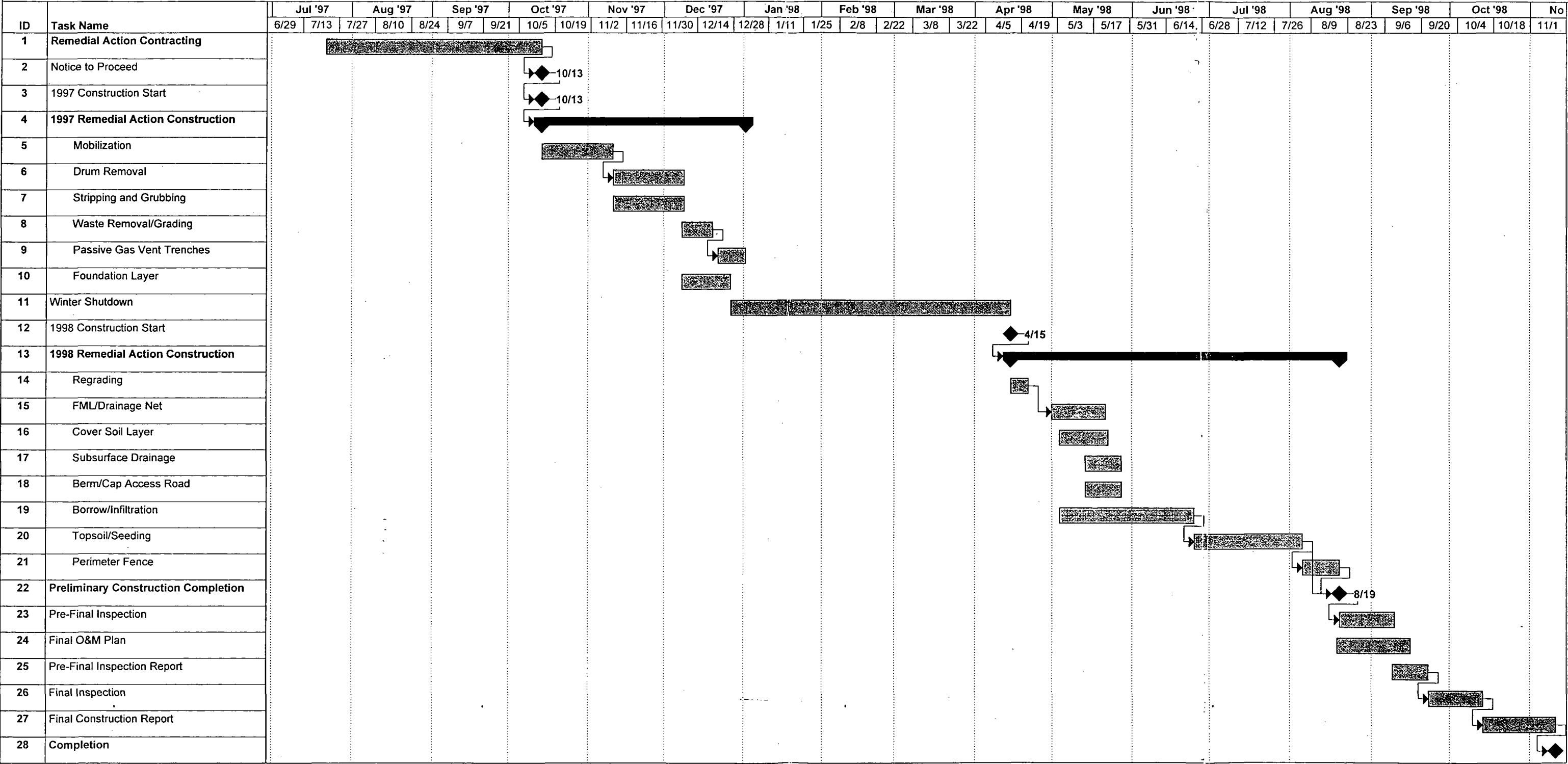
Completion of Remedial Action Report	Thirty (30) days after Pre-certification Inspection
Pre-certification Inspection for Completion of Work	Ninety (90) days after all phases of work performed
Completion of Work Report	Thirty (30) days after Pre-certification Inspection for Completion of Work
Monthly Progress Reports	Tenth day of each month following the effective date of the UAO until U.S. EPA issues Certification of Completion
Monitoring Reports	As specified in the Performance Monitoring Plan of the approved RD
Work Plan for Additional Response Actions, if required	Thirty (30) days after receipt of notice from U.S. EPA that additional response actions are necessary

## **7.2 PROJECT SCHEDULE**

The anticipated project schedule for the RA is presented in Figure 7-1. The Group is responsible for maintaining the schedule with the support of the Project Team. The project schedule includes the scheduling of all construction activities outlined in Section 3 of this Plan.

A final construction schedule will be submitted by the selected Contractor within 5 days of selection.

FIGURE 7-1  
CONSTRUCTION SCHEDULE  
ALBION-SHERIDAN TOWNSHIP LANDFILL





- W.W. Engineering & Science, April 1994, Final Remedial Investigation Report of the Albion-Sheridan Township Landfill, Albion, Michigan, U.S. EPA Contract No. 68-W8-0079.
- U.S. EPA (1988) Community Relations in Superfund - A Handbook, EPA/540/G-88/002, OSWER Directive 9230.0-3B.
- U.S. EPA (1986) Superfund Remedial Design and Remedial Action Guidance, OSWER 9355.04A.
- U.S. EPA Region V (1995) Statement of Work for Remedial Design and Remedial Action at Albion-Sheridan Township Landfill Site, Calhoun County, Michigan.
- U.S. EPA Region V (1995) Declaration for the Record of Decision, Albion-Sheridan Township Landfill Site, Albion, Michigan.
- U.S. EPA Region V (1995) Unilateral Administrative Order For Remedial Design and Remedial Action, Albion-Sheridan Township Landfill, City of Albion, Corning Glass, Inc., Decker Manufacturing, Inc., and Cooper Industries, Inc., Group.
- Woodward-Clyde Consultants (1996) Pre-Design Studies Report Albion-Sheridan Township Landfill, Calhoun County, MI.
- Woodward-Clyde Consultants (1997) Preliminary (30%) Design Albion-Sheridan Township Landfill, Calhoun County, MI.





**APPENDIX A  
FINAL REPORT**

**STATEMENT OF WORK FOR  
REMEDIAL DESIGN AND  
REMEDIAL ACTION**

**ALBION SHERIDAN TOWNSHIP  
LANDFILL  
CALHOUN COUNTY, MI**

*Prepared for*  
Cooper Industries  
Houston Texas

and

Corning, Inc.  
Corning, New York

August, 1997

**Woodward-Clyde** 

38777 West Six Mile Road  
Suite 200  
Livonia, Michigan 48151  
6E13045



STATEMENT OF WORK  
FOR REMEDIAL DESIGN AND REMEDIAL ACTION  
AT  
ALBION-SHERIDAN TOWNSHIP LANDFILL SITE  
CALHOUN COUNTY, MICHIGAN

TABLE OF CONTENTS

I. PURPOSE.....	1
II. DESCRIPTION OF REMEDIAL ACTION.....	1
Site Security.....	1
Restrictive Covenants.....	1
Drummed Waste.....	2
Landfill Cap.....	2
Monitoring Program .....	4
Contingent Remedy .....	6
III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION.....	10
Task 1: Remedial Design Work Plan.....	11
Task 2: Pre-design Studies.....	12
Task 3: Remedial Design.....	13
Task 4: Remedial Action Work Plan.....	14
Task 5: Remedial Action Construction.....	15
Task 6: Contingent Remedy.....	17
Task 7: Operation and Maintenance.....	19
Task 8: Performance Monitoring.....	20
Task 9: Remedial Action Completion.....	21
IV. CONTENT OF SUPPORTING PLANS.....	22
V. SUMMARY OF MAJOR DELIVERABLES/SCHEDULE.....	26

ordinance to prohibit the installation of any groundwater drinking water well which draws water from the area shown in Figure 4 of the ROD to contain 2 ug/l arsenic or more.

All restrictions regarding future development of the Landfill shall be considered permanent, while U.S. EPA may advise lifting the restrictions regarding the future installations of groundwater drinking water wells when the arsenic levels within the groundwater in the area noted above remain for two years below the MCL.

### 3. Excavation and Disposal of Drummed Waste

The Respondents shall excavate the test pit area designated TP09 on Figure 5 of the ROD to uncover all drums, as specified in the ROD. Drums found to contain solid or liquid wastes which are structurally sound enough to remove with wastes intact, as determined by U.S. EPA, shall be removed to the staging area for characterization. In addition, all other structurally sound drums containing solid or liquid wastes encountered during consolidation or site preparation shall be removed to the staging area for characterization. Where practical, Respondents shall also remove liquid wastes from structurally unsound drums encountered at TP09 or during consolidation or site preparation and transport it to the staging area for characterization. Respondents shall overpack, as necessary, all excavated drums showing signs of degradation. Respondents shall include all overpacked drums excavated by the MDNR during test pitting, which are temporarily secured on the surface of the landfill, with other excavated drums for characterization and disposal. Respondents shall sample and analyze excavated drum contents for RCRA characterization and dispose off-site, as specified in the ROD, all liquid wastes and those solid wastes found to contain constituents in concentrations exceeding land disposal restrictions, or constituents for which incineration or stabilization as a treatment method is prescribed. Respondents may incorporate those drums containing solid wastes which do not trigger land disposal restrictions under the landfill cap.

### 4. Construction, Installation, and Maintenance of Landfill Cap

The Respondents shall design and construct an on-site landfill cap that meets or exceeds the substantive requirements of RCRA Subtitle D (40 CFR Part 241) and any more stringent requirements of Part 115 of the Natural Resources and Environmental Protection Act, 1994 PA 451 (Act 451 Part 115) (formerly known as the Michigan Solid Waste Management Act or Act 641) which are applicable or relevant and appropriate to the Site, as determined by U.S. EPA. Respondents shall cap the entire landfill waste mass shown on Figure 1 of the ROD, including site preparation and layout to re-route surface water drainage away from the capped area. Respondents shall consolidate waste on the east edge of the landfill as specified on page 24 of the ROD. Also as specified on page 24 of the ROD,

the Remedial Action comply with approved plans and design documents and performance standards. Respondents shall submit monitoring programs as part of the Remedial Design Work Plan (RD Work Plan), which shall address the specific components of the remedial action listed below. Groundwater and air monitoring samples shall be analyzed for the parameters included in this SOW or for the parameters required and approved by U.S. EPA in the RD.

#### A. Groundwater Monitoring

The Respondents shall implement a groundwater monitoring program as identified in the RD Work Plan or as required by U.S. EPA. The Respondents shall design the groundwater monitoring program to detect changes in the chemical concentration of the groundwater at and adjacent to the site. After construction of the landfill, Respondents shall monitor groundwater as specified below for at least five years following attainment of the performance standard for arsenic. The groundwater monitoring program shall include, but not be limited to:

- (1) Quarterly sampling of wells identified in Table 1, below, for arsenic, ammonia, pH, Eh, dissolved oxygen and any other parameters identified in the approved RD.
- (2) Quarterly sampling of drinking water wells RW02, RW04, RW05, RW06, RW07, RW08, and RW10 as identified in Figure 10 of the RI Report, for all constituents sampled at residential wells during the RI and any other parameters identified in the approved RD;
- (3) Annual sampling of all wells identified in Table 1, below, for arsenic, ammonia, pH, Eh, dissolved oxygen, aluminum, antimony, benzene, cobalt, 1,2-Dibromo-3-chloropropane, manganese, nickel, and vinyl chloride (i.e., constituents previously found above Michigan Act 307 Type B levels in groundwater at the site), and any other parameters identified in the approved RD;
- (4) Measurement of the ground water elevation whenever a monitoring well is sampled, to confirm groundwater flow directions at the site.

Within the schedule established in the RD Work Plan, Respondents shall install four new monitoring wells at the locations specified on page 26 of the ROD. Respondents shall vertically sample each of the new monitoring wells, in accordance with current MDNR guidance. During Pre-design Studies, Respondents shall also record the water levels of all existing and new monitoring wells and sample all existing and new monitoring wells for target compound list (TCL) organics, target analyte list (TAL) inorganics, and 1,2-dibromo-3-chloropropane. Respondents shall conduct all analyses using methods which will achieve method detection limits equal to or less

at the locations and frequency specified in the approved RD. At all times during construction and during all other phases of the Remedial Action, Respondents shall ensure that air emissions do not exceed a cumulative cancer risk of  $10^{-6}$  at the landfill fenceline, using risk calculation methods set forth in Risk Assessment Guidance for Superfund. In addition, the air emissions shall not exceed any ARARs, including, but not limited to, the Michigan Act 451 Part 55, if applicable, and the federal Clean Air Act. If air emissions exceed these levels, Respondents shall take corrective measures as developed in the RD.

### C. Points of Compliance

In order to monitor and evaluate the remedial actions throughout the Site, certain locations at which there are groundwater monitoring wells shall be selected as points of compliance, pursuant to Task 8 (Performance Monitoring) of the SOW. Wells designated as the Points of Compliance and which shall be sampled are identified in Table 1 of this SOW. All these wells shall be considered as groundwater points of compliance. If any of the wells are destroyed or in any way becomes unusable, the Respondents shall repair or replace each well, unless EPA determines that repair or replacement is not necessary. EPA may designate as points of compliance, additional wells required by the RD Work Plan and the Operation and Maintenance (O&M) Plan. The location of any additional wells installed pursuant to the UAO or this SOW shall be approved by the U.S. EPA.

Points of Compliance for the monitoring and evaluation of the landfill gas collection and flaring shall be addressed in the O&M Plan.

## 6. Installation and Operation of Contingent Remedy for Groundwater Treatment

### A. Implementation of Contingent Remedy

Five years from the date on which construction of the landfill cap is complete, Respondents shall submit to U.S. EPA the results of a statistical test, described in the ROD and in Section III, Task 6 of this SOW, on wells in which the arsenic concentration has exceeded 0.05 mg/l at any time during the monitoring period (currently only MW06SB). From the results of this statistical test, U.S. EPA, in consultation with MDNR, will determine whether arsenic is declining sufficiently fast to fall below 0.05 mg/l within 15 years of completion of the landfill cap. If U.S. EPA determines that any well fails this test, Respondents shall write a Work Plan, conduct pilot testing, design and install a system for in-situ oxidation of groundwater to restore groundwater to the performance standard. The Respondents shall operate the groundwater treatment system until the groundwater performance standard is met at each of the wells listed in Table 1 and any

for an additional period of at least 2 months following a temporary shutdown of the treatment system as described in the paragraph below. During the 24-month period, Respondents shall collect groundwater samples on a quarterly basis from all monitor wells (i.e., at least 8 samples from each compliance point). Samples collected during this 24-month period shall be analyzed for arsenic, ammonia, pH, Eh, and dissolved oxygen.

The petition to cease operation of the groundwater treatment system shall include monitoring of the water quality in the aquifer after treatment has been temporarily stopped. This temporary shutdown of the system shall be sufficiently long as is necessary to allow the 3dimensional groundwater flow system and chemical equilibrium to attain the steady-state condition which will exist when groundwater remediation has ceased. At a minimum, a series of samples taken at time after shutdown intervals of 1 hour, 1 day, 1 week, and approximately 60 days are required. The Respondents shall maintain the temporary shutdown of the treatment system for no more than 60 days. The Respondents shall restart the groundwater treatment system and continue its operation until a petition to cease operation is approved in writing by U.S. EPA.

U.S. EPA will consider the groundwater to have achieved the performance standard if the distribution of these data show that the 95% one-sided confidence interval of the arsenic concentration for the last 24 months at each selected monitoring point is equal to or less than the groundwater performance standard. See U.S. EPA Guidance, "Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Ground Water", and any amendment to that guidance. Upon U.S. EPA's approval of the petition to cease operation, Respondents may terminate the groundwater treatment system.

#### D. Notification of Temporary Shutdown of the Groundwater Treatment System

For any interruption of any portion of the groundwater treatment system, Respondents shall describe the nature and cause of the interruption, the length of time of the interruption, and measures that have been taken to prevent further shutdowns in Respondents' next scheduled progress report. If for any reason during the operation of the groundwater treatment system, the operation of any portion is interrupted or stopped for a period of 24 hours or more, whether due to mechanical failure, human error, or any other reason (except for scheduled maintenance), the Respondents shall notify U.S. EPA and MDNR within 24 hours after learning of such interruption or cessation of operation. Notification shall include information on the nature and cause of the interruption of the system as well as the estimated time before operation of the system shall resume. The Respondents also shall notify U.S. EPA and MDNR upon reactivation of the system. In cases where cessation of operation exceed two weeks, Respondents shall provide progress

approved by the U.S. EPA.

#### F. Post-Shutdown Monitoring and Restart

After discontinuing operation of the groundwater treatment system pursuant to Subpart 6C, above, the Respondents shall thereafter perform annual monitoring of each well listed in Table 1, in order to verify that the groundwater performance standard is being maintained. Upon written approval of U.S. EPA, in consultation with MDNR, Respondents may decrease the number of wells for post-shutdown monitoring. Post-shutdown sampling shall include arsenic, ammonia, pH, Eh, dissolved oxygen, aluminum, antimony, benzene, cobalt, 1,2-Dibromo-3-chloropropane, manganese, nickel, and vinyl chloride (i.e., constituents previously found above Michigan Act 307 Type B levels in groundwater at the site), and any other parameters identified in the approved RD. Such monitoring shall continue until the Respondents demonstrate that the performance standard established in the ROD and SOW have been continuously satisfied for five years following final shutdown of the groundwater treatment system.

If post-shutdown groundwater monitoring indicates that the 95% one-sided confidence interval of arsenic's concentration at any selected monitoring point has increased above the groundwater performance standard after groundwater treatment has been terminated in accordance with Subpart 6C, above, the Respondents shall reactivate the groundwater treatment system. If the Respondents are required to reactivate the system, the Respondents shall thereafter operate and maintain the groundwater treatment system until they again demonstrate compliance with the groundwater performance standard as provided in Subpart 6A and the shutdown requirements of Subpart 6C.

### III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action shall consist of nine tasks. All plans are subject to EPA approval.

Task 1: Remedial Design Work Plan

Task 2: Pre-design Studies

Task 3: Remedial Design

Task 4: Remedial Action Work Plan

Task 5: Remedial Action Construction

Task 6: Contingent Remedy

7. Plans for assisting U.S. EPA in community involvement when requested by U.S. EPA.

The QAPP, Site Health and Safety Plan, and Field Sampling Plan shall cover all pre-design and design tasks, and to the extent possible, shall accommodate the Remedial Action as well, so that minimal revision is needed prior to construction. These plans shall include each of the elements listed in Section IV of this SOW.

In the plans for completing site access, Respondents shall use best efforts, consistent with Section XVI of the UAO, to secure site access for the Respondents, the United States and its representatives, as necessary to effectuate the UAO, including the payment of reasonable sums of money in consideration of access.

#### Task 2: Pre-design Studies

This Remedial Action requires pre-design studies to supplement the available technical data. These pre-design studies include, but are not limited to:

1. Native species revegetation study;
2. Gas emissions study;
3. Installation of four additional monitoring wells;
4. Groundwater sampling

The Respondents shall evaluate the costs and practicability of revegetating the landfill cap with native species, and evaluate gas emissions from the landfill, as described on page 25 of the ROD and page 3 of this SOW. The Respondents also shall install new monitoring wells, and sample new and existing wells, as described on page 26 of the ROD and page 4 of this SOW.

The Respondents shall implement the pre-design studies in accordance with the final RD Work Plan. The results of the pre-design studies shall be submitted in a Pre-design Studies Report which shall be submitted within the schedule approved in the final RD Work Plan.

#### Task 3: Remedial Design

Respondents shall prepare construction plans and specifications to implement the Remedial Actions at the Site as described in the ROD and this SOW. Plans and specifications shall include each of the items listed in Section IV of this SOW and shall be submitted in accordance with the schedule set forth in Section V below. Subject to approval by U.S. EPA, Respondents may submit more than one set of design submittals reflecting different components of the Remedial Action. All plans and specifications shall be developed in accordance with U.S. EPA's Superfund Remedial Design and Remedial Action Guidance (OSWER Directive No. 9355.0-4A) and shall

### C. Final Design

Respondents shall submit the Final Design when the design effort is 100% complete. The Final Design shall fully address all comments made to the preceding design submittal. The Final Design shall include reproducible drawings and specifications suitable for bid advertisement. The Final Design shall include those elements listed for the Preliminary Design, as well as, the following:

- Final Performance Monitoring Plan;
- Final Construction Quality Assurance Plan;
- Final Contingency Plan (unless included in Site Health and Safety Plan)
- Draft Operation and Maintenance Plan;
- Capital and Operation and Maintenance Cost Estimate.

The Respondents shall review the Draft Operation and Maintenance Plan following construction and shall submit a Final Operation and Maintenance Plan to U.S. EPA no later than the date of the Pre-final Construction Inspection.

### Task 4: Remedial Action Work Plan

The Respondents shall submit a Remedial Action (RA) Work Plan which includes a detailed description of the remediation and construction activities. The RA Work Plan shall include a project schedule for each major activity and submission of deliverables generated during the Remedial Action, including specific dates for completion of the project. The Respondents shall submit a RA Work Plan in accordance with § XII and Paragraph 36 of the UAO and Section V of this SOW.

The RA Work Plan shall include as attachments an RA QAPP and an RA Site Health and Safety Plan. The RA Work Plan shall also include any revisions to the Field Sampling Plan needed for Remedial Action.

If some or all of the RA is to be performed by contractor(s), the RA Work Plan shall include plans to provide U.S. EPA with copies of all bid specifications, if they have not been provided previously. The RA Work Plan shall also include a schedule for the Respondents, pre-bid meeting, bid review, and contract award.

### Task 5: Remedial Action Construction

The Respondents shall implement the Remedial Action as detailed in



prefinal construction inspection report, the Respondents shall notify the U.S. EPA and the MDNR for the purposes of conducting a final construction inspection. The final construction inspection shall consist of a walk-through inspection of the Facility by U.S. EPA and the Respondents. The prefinal construction inspection report shall be used as a checklist with the final construction inspection focusing on the outstanding construction items identified in the prefinal construction inspection. At the final construction inspection, Respondents shall confirm that outstanding items have been resolved.

#### 1. Prefinal Construction Inspection Report

Within 15 days of the prefinal construction inspection, the Respondents shall submit a Prefinal Construction Inspection Report which outlines the outstanding construction items, actions required to resolve outstanding items, completion dates for these items, and includes a proposed date for the final construction inspection. The Prefinal Construction Inspection Report may be submitted in the form of a punch list or a letter.

#### 2. Final Construction Report

Within 30 days of a successful final construction inspection, Respondents shall submit a Final Construction Report. In the report, a registered professional engineer and the Respondents' Project Coordinator shall state that the Remedial Action has been constructed in accordance with the design and specifications. The Final Construction Report shall contain the following statement, signed by a responsible corporate official of a Respondent or the Respondents' Project Coordinator:

"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The final construction report shall include, but not be limited to, the following elements:

- a. Chronology of events;
- b. Summary of Performance Standards and Construction Quality Control;
- c. Summary of construction activities;
- d. Summary of final construction inspection;
- e. Certification of the design and construction;

responsibility and authority of all organizations and key personnel involved with the implementation and shall include a description of qualifications of key personnel, including contractor personnel.

The Work Plan for Groundwater Treatment also must include the following items:

- a. Detailed plans for pilot testing and a schedule for submittal of a Pilot Testing Report for Groundwater Treatment;
- b. A schedule for submittal of Preliminary and Final Design for Groundwater Treatment;
- c. A preliminary schedule for a pre-construction meeting, pre-final and final inspections, Completion of Construction Report, and Completion of Work Report.
- d. Plans and schedule for selection of contractor; and
- e. Construction schedule, including completion of construction.

The Work Plan for Groundwater Treatment shall also include any necessary updates to the approved Quality Assurance Project Plan (QAPP), Site Health and Safety Plan, and Field Sampling Plan. The plan shall also include any additional plans for site access which are necessary for the contingent remedy.

Upon U.S. EPA approval of the Work Plan for Groundwater Treatment, Respondents shall conduct Pilot Studies to determine whether air or another oxidant is most suitable for the site and to assist with design of the system. Respondents shall submit a Pilot Studies Report, a Preliminary Design and a Final Design within the schedule approved in the Work Plan.

The Preliminary and Final Design shall include each of the items listed under Task 3 of this SOW, unless notified in writing by U.S. EPA that certain elements are not necessary.

#### C. Construction of Groundwater Treatment System

Within 90 days of U.S. EPA approval of the Final Design, Respondents shall award contract(s) for the groundwater treatment system. Respondents shall initiate and complete construction of the groundwater treatment system within the schedule approved in the Work Plan for Groundwater Treatment.

Upon completion of construction of the groundwater treatment system, the Respondents shall complete each of the items listed under Task 5 as they apply to the groundwater treatment system, including notification of U.S. EPA for pre-final and final construction inspections and submittal of pre-final and final construction reports.

- and
  - b. Schedule for implementing these corrective actions.
- 6. Safety plan;
  - a. Description of precautions, of necessary equipment, etc., for Site personnel; and
  - b. Safety tasks required in event of systems failure.
- 7. Description of equipment; and
  - a. Equipment identification;
  - b. Installation of monitoring components;
  - c. Maintenance of Site equipment; and
  - d. Replacement schedule for equipment and installed components.
- 8. Records and reporting mechanisms required.
  - a. Daily operating logs;
  - b. Laboratory records;
  - c. Records for operating costs;
  - d. Mechanism for reporting emergencies;
  - e. Personnel and maintenance records; and
  - f. Monthly/annual reports to State agencies.

#### **Task 8: Performance Monitoring**

Respondents shall implement performance monitoring as approved in the Remedial Design to ensure that all performance standards are met. The performance monitoring program shall assess the performance of drum removal and treatment, construction of landfill cap and landfill gas collection system, groundwater monitoring program, and, if implemented, the groundwater treatment system. In the monthly progress reports required under Section XI of the UAO, Respondents shall submit details concerning progress toward attainment of performance standards for each remedial action task which is in progress.

If requested by U.S. EPA pursuant to Section VIII of the UAO, the Respondents shall conduct any additional investigations and shall submit any additional reports required by U.S. EPA in order to permit U.S. EPA to meet the five-year review requirements of Section 121(c) of CERCLA and applicable regulations.

#### **Task 9: Remedial Action Completion**

- A. Completion of Remedial Action

the Contingency Plan and the Construction Quality Assurance Plan -- are documents which must be prepared and submitted as outlined in Section III of this SOW. The following section describes the required contents of each of these supporting plans.

Because similar tasks may be performed at different points in the Remedial Action, e.g., with respect to implementation of the contingent remedy, a single QAPP, a single Health and Safety Plan (and Contingency Plan), a single Field Sampling Plan, a single Construction Quality Assurance Plan, may be prepared. These documents, however, may be supplemented to reflect successive tasks. Such amendments shall be approved by U.S. EPA, in consultation with MDNR, and shall be submitted to U.S. EPA as addenda to the original plans.

#### A. Quality Assurance Project Plan

The Respondents shall develop a Site specific Quality Assurance Project Plan (QAPP), covering sample analysis and data handling for samples collected in all phases of future Site work, based upon the UAO and guidance provided by U.S. EPA. The QAPP shall be consistent with the requirements of the EPA Contract Lab Program (CLP) for laboratories proposed outside the CLP. The Region 5 model QAPP will be provided to the Respondents to facilitate preparation of the QAPP. The QAPP shall at a minimum include:

##### Project Description

- \* Facility Location History
- \* Past Data Collection Activity
- \* Project Scope
- \* Sample Network Design
- \* Parameters to be Tested and Frequency
- \* Project Schedule

##### Project Organization and Responsibility

##### Quality Assurance Objective for Measurement Data

- \* Level of Quality Control Effort
- \* Accuracy, Precision and Sensitivity of Analysis
- \* Completeness, Representativeness and Comparability

##### Sampling Procedures

##### Sample Custody

- \* Field Specific Custody Procedures
- \* Laboratory Chain of Custody Procedures

##### Calibration Procedures and Frequency

- \* Field Instruments/Equipment
- \* Laboratory Instruments

Personnel  
 Levels of protection  
 Safe work practices and safe guards  
 Medical surveillance  
 Personal and environmental air monitoring  
 Personal protective equipment  
 Personal hygiene  
 Decontamination - personal and equipment  
 Site work zones  
 Contaminant control  
 Contingency and emergency planning  
 Logs, reports and record keeping

The safety plan shall follow U.S. EPA guidance and all OSHA requirements as outlined in 29 CFR 1910 and 1926.

Contingency Plan [Stand alone or in Site Health and Safety Plan]

Respondents shall submit a Contingency Plan describing procedures to be used in the event of an accident or emergency at the site. The draft Contingency Plan shall be submitted with the prefinal design and the [draft] final Contingency Plan shall be submitted with the final design. [The final Contingency Plan shall be submitted prior to the start of construction, in accordance with the approved construction schedule.] The Contingency Plan shall include, at a minimum, the following:

1. Name of the person or entity responsible for responding in the event of an emergency incident.
2. Plan and date(s) for meeting(s) with the local community, including local, State and Federal agencies involved in the cleanup, as well as local emergency squads and hospitals.
3. First aid medical information.
4. Air Monitoring Plan (if applicable).
5. Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), as specified in 40 CFR Part 109 describing measures to prevent and contingency plans for potential spills and discharges from materials handling and transportation.

#### C. Field Sampling Plan

The Respondents shall develop a field sampling plan (as described in "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," October 1988). The Field Sampling Plan should supplement the QAPP and address all sample collection activities.

# V. SUMMARY OF MAJOR DELIVERABLES/SCHEDULE

A summary of the project schedule and reporting requirements contained in this SOW is presented below:

<u>Submission</u>	<u>Due Date</u>
1. Notify U.S. EPA of Project Coordinator	Within 15 days of effective date of the UAO
2. RD Work Plan	Sixty (60) days after Notice of Authorization to proceed with RD
3. Pre-design Studies Report	As approved in the RD Work Plan
4. Preliminary Design (30%)	Forty-five (45) days after U.S. EPA's approval of Pre-design Studies Report
5. Intermediate Design Meeting (60%)	Thirty (30) days after receipt of U.S. EPA's comments on the Preliminary Design
6. Final Design (100%)	Thirty (30) days after Intermediate Design Meeting
7. RA Work Plan	Thirty (30) days after approval of Final Design
8. Award Construction Contract(s)	Thirty (30) days after approval of RA Work Plan
9. Pre-Construction Inspection and Meeting	Fifteen (15) days after Award of RA Contract(s)
10. Initiate Construction of RA	Fifteen (15) days after Pre-Construction Inspection and Meeting
11. Completion of Construction	As approved by U.S. EPA in RA Work Plan
12. Prefinal Construction Inspection	Thirty (30) days after Respondents' assessment that construction is complete

- performance standards attained.
26. Completion of Remedial Action Report  
Thirty (30) days after Pre-certification Inspection
27. Pre-certification Inspection for Completion of Work  
Ninety (90) days after all phases of work performed
28. Completion of Work Report  
Thirty (30) days after Precertification Inspection for Completion of Work
29. Monthly Progress Reports  
Tenth day of each month following the effective date of the UAO until U.S. EPA issues Certification of Completion.
30. Monitoring Reports  
As specified in the Performance Monitoring Plan of the approved RD
31. Work Plan for Additional Response Actions, if required  
Thirty (30) days after receipt of notice from U.S. EPA that additional response actions are necessary





**APPENDIX B**  
**FINAL REPORT**

**MODEL HEALTH AND SAFETY  
PLAN ALBION SHERIDAN  
TOWNSHIP LANDFILL  
CALHOUN COUNTY, MI**

*Prepared for*  
Cooper Industries  
Houston Texas

and

Corning, Inc.  
Corning, New York

August, 1997

**Woodward-Clyde** 

38777 West Six Mile Road  
Suite 200  
Livonia, Michigan 48151  
6E13045

# TABLE OF CONTENTS

---

<b>Section 1</b>	<b>Project Identification.....</b>	<b>1-1</b>
<b>Section 2</b>	<b>Introduction .....</b>	<b>2-1</b>
2.1	Site Description.....	2-1
2.2	Key Personnel .....	2-1
2.2.1	Project Manager .....	2-1
2.2.2	Corporate Health And Safety Officer .....	2-2
2.2.3	Site Safety Officer.....	2-2
2.2.4	Engineer And Other Personnel .....	2-3
<b>Section 3</b>	<b>Scope Of Work .....</b>	<b>3-1</b>
3.1	Safety In Case Of System Failure.....	3-1
<b>Section 4</b>	<b>Hazard Assessment.....</b>	<b>4-1</b>
4.1	Chemical Hazards .....	4-1
4.1.1	Description Of Chemical Hazards .....	4-1
4.1.2	Control Of Exposure To Chemical Hazards .....	4-2
4.2	Physical Hazards, Heat Stress And Cold Exposure .....	4-2
4.2.1	Severe Weather .....	4-3
4.3	Biological Hazards.....	4-3
4.3.1	Insects .....	4-3
4.3.2	Other Animals.....	4-3
4.3.3	Microorganisms .....	4-4
4.3.4	Poisonous Plants .....	4-4
4.4	Flammable Hazards .....	4-4
4.5	General Exposure Risk .....	4-4
4.5.1	Airborne .....	4-4
4.5.2	Skin .....	4-5
4.5.3	Ingestion.....	4-5
4.5.4	Persistence Of Heavy Metals .....	4-5
<b>Section 5</b>	<b>General Health And Safety Requirements .....</b>	<b>5-1</b>
5.1	Medical Examination.....	5-1
5.2	Training.....	5-1
5.3	Incident Reporting .....	5-1
5.4	Illumination, Sanitation And Confined Space Entry .....	5-2
5.4.1	Illumination.....	5-2
5.4.2	Sanitation .....	5-2
5.4.3	Confined Space Entry .....	5-2
5.5	Work Procedures.....	5-2

# TABLE OF CONTENTS

5.6	Respirator Maintenance, Fitting And Decontamination .....	5-2
5.7	Site Safety Officer Notification .....	5-3
5.8	Project Safety Log.....	5-3
5.9	OSHA Information Poster.....	5-4
5.10	Prohibitions.....	5-4
5.11	Initial Site Safety Meeting And Signing Of Health And Safety Plan Compliance Agreement .....	5-4
5.12	Site Safety Briefings .....	5-4
5.13	Underground Structures .....	5-5
<b>Section 6</b>	<b>Air Quality Monitoring And Mitigative Measures For Control Of Emissions .....</b>	<b>6-1</b>
6.1	Air Quality Monitoring Instrumentation.....	6-1
6.2	Air Quality Response Levels .....	6-3
6.3	Air Monitoring Requirements During Remedial Actions.....	6-5
6.3.1	Drum Removal And Treatment .....	6-5
6.3.2	Landfill Cap Construction.....	6-5
6.3.3	Landfill Gas Collection System Construction .....	6-5
6.4	Mitigative Measures For Control Of Emissions .....	6-5
<b>Section 7</b>	<b>Personal Protective Equipment.....</b>	<b>7-1</b>
7.1	Description Of Levels Of Protection .....	7-1
7.2	Initial Ppe Levels For Specific Work Tasks .....	7-2
<b>Section 8</b>	<b>Designation Of Work Zones .....</b>	<b>8-1</b>
<b>Section 9</b>	<b>Decontamination Procedures .....</b>	<b>9-1</b>
<b>Section 10</b>	<b>Emergency Response Plan .....</b>	<b>10-1</b>
10.1	Emergency Recognition And Prevention.....	10-1
10.1.1	Fires.....	10-3
10.1.2	Chemical Exposures.....	10-3
10.1.3	Physical Injuries.....	10-3
10.2	Model Contingency Plan.....	10-4
10.2.1	Contingency And Emergency Response Plan.....	10-4
10.2.2	Spill Response.....	10-6
10.3	Emergency Alerting Procedures .....	10-7
10.4	Evacuation Procedures And Routes.....	10-7
10.5	Telephone Numbers Of Emergency Services .....	10-7
10.6	Emergency Response Personnel .....	10-7
10.7	Decontamination Procedures During An Emergency .....	10-8

# TABLE OF CONTENTS

---

10.8	Emergency Medical Treatment And First Aid Recommended Procedures.....	10-8
10.9	Directions To The Albion Community Hospital From Site .....	10-8
10.9.1	Notification Of Michigan OSHA.....	10-9
<b>Section 11</b>	<b>Geotechnical Laboratory Considerations.....</b>	<b>11-1</b>
<b>Section 12</b>	<b>Personnel Assignments .....</b>	<b>12-1</b>
12.1	Project Personnel .....	12-1
12.2	Project Safety Responsibilities .....	12-1
<b>Section 13</b>	<b>Health And Safety Plan Approvals.....</b>	<b>13-1</b>
<b>Section 14</b>	<b>Health And Safety Plan Compliance Agreement.....</b>	<b>14-1</b>
 <b>Tables</b>		
Table 1	Chemicals of Concern	
 <b>Figures</b>		
Figure 1	Site Location Map	
Figure 2	Hospital Location Map	
 <b>Attachments</b>		
Attachment A Material Safety Data Sheets (MSDS)		
Attachment B Health and Safety Standard Operating Procedures		

*Woodward-Clyde Consultants (WCC) has prepared this Health and Safety Plan in a generic format as a basis for U.S. Environmental Protection Agency approval of the Remedial Action Work Plan. Upon selection, the Group's contractors will be required to implement a site specific Health and Safety Plan.*

## SECTION ONE

## Project Identification

---

Client: Albion-Sheridan Landfill Group  
Site: Albion-Sheridan Township Landfill  
Location: Albion, Michigan  
Project No.:  
Project Manager:  
Date of Plan: April 15, 1997  
Expiration Date of Plan: December 31, 2005

This Model Health and Safety Plan (HASP) establishes guidelines and requirements for safety of contractor and subcontractor personnel during the remedial action at the Albion-Sheridan Township Landfill (ASTL). The contractor for the remedial action shall submit a site-specific HASP to the Group that meets the minimum requirements of the model HASP. All employees of the contractor and its subcontractors, and other contractors who have adopted the site-specific HASP involved in field activities on this project are required to abide by the provisions of the site-specific HASP.

The health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. Because of the activity and site conditions which may be encountered, and the uncertainties associated with potential health effects from exposures to various contaminants which may be present, no guarantees can be made regarding the potential for health effects associated with field activities on this site. This HASP outlines the health and safety procedures and equipment required for conducting activities at this site to minimize the potential for exposure to field personnel.

## **2.1 SITE DESCRIPTION**

The following site description is summarized from the ROD (U.S. EPA, 1995) and the SOW (U.S. EPA, 1995). The Albion-Sheridan Township Landfill is an inactive (since 1981), approximately 18-acre municipal and industrial landfill located at 29975 East Erie Road in Calhoun County, Albion, Michigan (Figure 1).

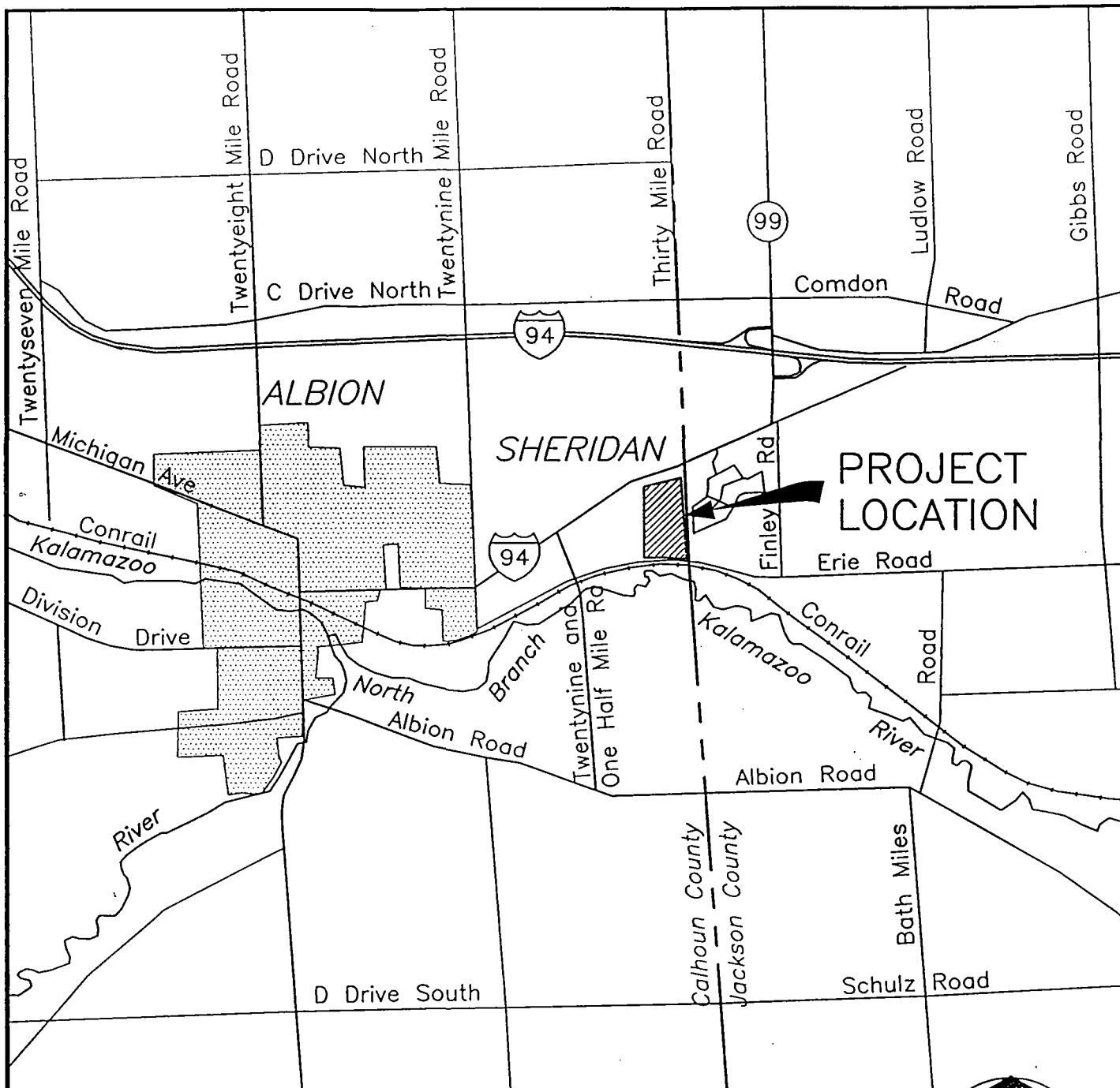
More specifically, the site is located in Township 2 South, Range 4 West, Section 36 (SE 1/4) approximately one mile east of Albion, Michigan (Figure 1). The site is situated between Michigan Avenue and East Erie Road. A combination of residential, agricultural, commercial and industrial properties surround the site. One residence is located immediately adjacent to the site to the south and five additional residences are located approximately 1000 to 1500 feet southwest of the site along East Erie Road. An active railroad track borders East Erie Road to the south and beyond the railroad tracks lies the North Branch of the Kalamazoo River (approximately 400 feet south of the site). South of the river is agricultural land.

The site is bordered on the east by the Calhoun/Jackson County line and the Amberton Village housing development, with the closest residences being approximately 500 feet from the landfill. Several residences and commercial businesses are located along Michigan Avenue approximately 500 feet north of the site. Immediately west of the site is undeveloped land formerly used for agriculture. Orchard Knoll subdivision is located approximately 1500 feet northwest of the site. Approximately 2000 feet northwest of the site is a landfill associated with Brooks Foundry. Approximately one mile west is the city of Albion, Michigan.

## **2.2 KEY PERSONNEL**

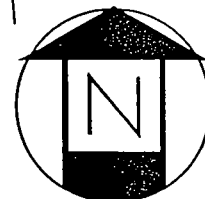
### **2.2.1 Project Manager**

The Project Manager has the following responsibilities:

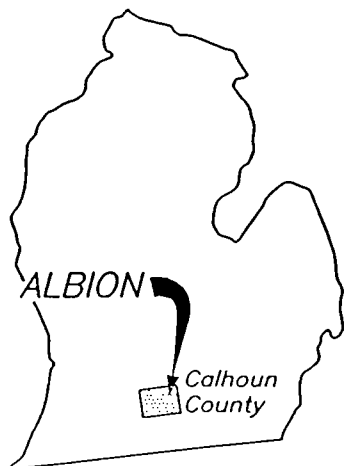


# VICINITY MAP

NOT TO SCALE



ALBION-SHERIDAN TOWNSHIP LANDFILL  
ALBION, MICHIGAN



**Woodward-Clyde Consultants**

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

## SITE LOCATION MAP

DRN BY: KAH

DATE: MAY 1997

PROJECT NO.

FIG. NO.

CHK'D BY: DS

DATE: MAY 1997

6E13045

1



- To see that the project is performed in a manner consistent with the Health and Safety Program.
- To have a HASP prepared and approved.
- To provide the Corporate Health and Safety Officer (CHSO) with project information related to health and safety matters and development of the HASP
- To implement the HASP
- To monitor compliance with the HASP by field personnel

The Project Manager has the authority to take the following actions:

- To determine matters relating to schedule, cost, and personnel assignments on hazardous waste management projects
- To temporarily suspend field activities, if the health and safety of field personnel are endangered, pending further consideration by the CHSO
- To temporarily suspend an individual from field activities for infractions of the HASP, pending further consideration by the CHSO

### **2.2.2 Corporate Health and Safety Officer**

The CHSO has the following responsibilities:

- To interface with the Project Manager in matters of health and safety
- To develop a HASP for the project and to submit it to the Project Manager
- To monitor compliance with approved HASP
- To assist the Project Manager in seeing that proper health and safety equipment is available for the project
- To approve personnel to work on this site with regard to medical examinations and health and safety training

The CHSO has the authority to take the following actions:

- To suspend work or otherwise limit exposures to personnel if a HASP appears to be unsuitable or inadequate
- To direct personnel to change work practices if they are deemed to be hazardous to health and safety
- To remove field personnel from the project if their actions or condition endangers their health and safety or the health and safety of coworkers

### **2.2.3 Site Safety Officer**

The Site Safety Officer (SSO) and any Alternate Site Safety Officer(s) have the following responsibilities:

- To direct health and safety activities on-site
- To report safety-related incidents or accidents to the Project Manager and CHSO
- To assist the Project Manager in all aspects of implementing the HASP
- To maintain health and safety equipment on-site, as specified in the HASP
- To inspect health and safety activities on-site, as specified in the HASP, and report results to the Project Manager and the CHSO

The SSO has the authority to take the following actions:

- To temporarily suspend field activities, if health and safety of field personnel are endangered, pending further consideration by the CHSO
- To temporarily suspend an individual from field activities for infractions of the HASP, pending further consideration by the CHSO

### 2.2.4 Engineer and Other Personnel

The site engineer and all other personnel are responsible for following all requirements of this HASP. Any incidents or variations from the plan must be discussed with the CHSO, project manager and SSO.

The remedial action work activities which may be performed under this HASP include but is not limited to the following:

- Performing, as needed, survey(s) of the site to establish property boundaries and current elevations
- Installing, sampling and abandoning groundwater monitoring wells
- Establishing site security
- Abandonment of underground storage tanks (USTs)
- Excavating, removing and characterizing and disposing buried drummed waste
- Constructing a multi-layer landfill cap
- Consolidating waste
- Installing and sampling a passive landfill gas venting system

This HASP does not cover any site activities other than those specifically listed above. Other possible work activities not described above may only be conducted after approval of an appropriate Addendum to this HASP by the CHSO.

This HASP is terminated on December 31, 2005. Use of this HASP after this date to perform the work activities described herein, or other activities in addition to those described herein, is not permitted and constitutes a violation of the Health and Safety Program. If work is to be performed after this date, the HASP must be reviewed and modified, if necessary, by the CHSO.

### **3.1 SAFETY IN CASE OF SYSTEM FAILURE**

Prior to initiation of Operation and Maintenance (O&M) activities, the selected O&M Contractor will be required to complete an O&M HASP to cover all O&M activities. The O&M HASP will be required to include safety precautions and pathways to be followed during system failure.

The following are potential system failures that require maintenance or could require emergency and contingency planning actions:

- failure of liner
- failure of monitoring systems requiring replacement or repair
- vandalism of security system or landfill cover
- excessive erosion
- excessive cover settlement
- excessive/unacceptable gas generation and migration

An assessment of the hazards has been made for each of the activities specified in Section 3.0. Suspected physical, biological, chemical and flammable hazards were evaluated. The following paragraphs summarize the risks that have been identified.

For the activity listed in Section 3.0, the following hazards have been identified:

- physical hazards
- heat stress (depending on season work is to be performed)
- cold stress (depending on season work is to be performed)
- biological hazards such as mosquitoes, ticks, snakes, and rabid animals
- skin and eye contact with contaminants
- ingestion of contaminants
- inhalation of organic vapors or contaminated dusts
- flammable hazards

## **4.1 CHEMICAL HAZARDS**

### **4.1.1 Description of Chemical Hazards**

The chemical hazard evaluation is based on the history of the Site and the initial investigations at the Site. The chemical hazard evaluation is conducted to identify materials that potentially may be present and to ensure that Site activities, personnel protection, and emergency response are consistent with the specific contaminants expected to be encountered. The hazard analysis forms the foundation for this HASP.

The landfill is currently covered with 1 to 4 feet of silty sand with refuse scattered at the surface. Scattered refuse on the surface includes metal, plastic, concrete, asphalt, 55-gallon drums, wood, tires, a storage tank, and a junk crane. Test pitting conducted by MDNR uncovered one area of concentrated drum disposal where an estimated 200 to 400 drums are present. Some of the drums contain liquid and solid wastes and suspected paint sludges, including up to 2.7 parts per million (ppm) arsenic, 730,000 ppm 1,2,4-trimethyl benzene, 40,000 ppm m/p xylene, 6,500 ppm acetone and 2,400 ppm aluminum.

The landfill ranges from 16 to 35 feet in thickness and is producing landfill gasses in the form of methane gas and volatile organic compounds (VOCs) in concentrations in excess of 10,000 ppm. The landfill waste contains numerous organic contaminants, including 10 VOCs, 19 semi-volatile compounds (SVOCs), 11 pesticides/PCBs, and inorganic contaminants including antimony, arsenic, chromium, copper, lead, mercury, and zinc.

A leachate plume extends southwest of the landfill for approximately 900 feet and extends vertically to a depth of approximately 45 feet below the water table. The unconsolidated aquifer plume contains 1,2-dibromo-3-chloropropane and antimony at concentrations above the federal Maximum Contaminant Level (MCL). The bedrock aquifer plume contains vinyl chloride at the MCL and arsenic above the MCL, at concentrations up to 126 ug/l.

Chemicals of concern on the site are summarized in Table 1. Material Safety Data Sheets (MSDS) for chemicals which may be encountered on site are presented in Attachment A.

#### **4.1.2 Control of Exposure to Chemical Hazards**

Ingestion of constituents of concern will be controlled on this site by prohibiting eating and smoking at the Site (see Section 8.0) and by requiring all field personnel to decontaminate themselves upon leaving the Exclusion Zone. Drinking of liquids will take place only after partial decontamination has taken place (except in a heat stress emergency situation). If necessary, drink breaks will be scheduled at least every two hours to avoid heat stress problems.

Skin and eye contact with some of the constituents at the site may cause skin or mucous membrane irritation or severe burns. Many of those constituents can be absorbed into the bloodstream through the skin or eyes.

Any body area which comes in contact with contaminated materials will be washed with soap and rinsed immediately. All field personnel will report any skin or eye contact symptoms to the SSO. The person will be treated by a physician and steps will be taken to eliminate similar exposures.

Potential hazards will be reduced by protecting against exposures to hazardous materials via utilization of appropriate personal protective equipment (PPE). PPE to protect the body against contact with known or anticipated chemical hazards can be divided into five levels of protection categories (Level A, B, C, Modified D, and D) according to the degree of protection afforded. The initial levels of personal protective equipment to be used while performing the activities at the Site described in Section 3.0 are discussed in Section 7.2, Initial PPE Levels for Specific Work Tasks. Personal Protective Equipment and Levels of Protection are discussed in Section 7.0 of this HASP.

#### **4.2 PHYSICAL HAZARDS, HEAT STRESS AND COLD EXPOSURE**

There is a risk of physical injury when working near heavy equipment. Field personnel shall be aware of these hazards and take steps to avoid contact with them. Physical hazards associated with construction activities are identified and safety procedures shall be followed.

Use of steel-toed steel shank work boots, safety glasses or goggles, and hard hats will be required when in the Exclusion Zone, Contamination Reduction Zone or otherwise working around heavy equipment. Personnel shall be cognizant that when PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition, the PPE required for some activities (coveralls and respirators) places a physical strain on the wearer. A Heat Stress Casualty Prevention Plan will be implemented to deal with this health hazard during warm weather. The Plan will outline heat stress identification, treatment, prevention and monitoring. Fluids will be provided at regular intervals during the work periods in order to maintain adequate body fluid levels for the field personnel. Heat Stress and Noise/Hearing Conservation are reviewed in Attachment B.

**TABLE 1**  
**Physicochemical Characteristics of Chemicals of Concern**  
**Albion-Sheridan Township Landfill**

	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Target Organs	Route of Exposure	Symptoms of Exposure	Vapor Pressure	Specific Gravity	Lower Explosive Limit	Upper Explosive Limit	Skin Hazard	Odor Threshold	Carcinogen Category	HNU % Response (Benzene)		OVA % (Methene) Response	Photon Correction Factor (Isobutylene)		MicroRAE Correction Factor (Isobutylene)	Ionization Potential	MW
								mm @ 68 F	Referenced to water or air	%	%				10.2 eV	11.7eV		10.6 eV	11.7 eV	10.6 eV	eV	grams
Acetone	67-64-1	1000 ppm (750 ppm ) (1000 ppm S)	750 ppm 1000 ppm S	2500 ppm	Eyes, skin, respiratory, central nervous	Inhalation, contact, ingestion	Dermatitis, irritation of nose and throat, headache, dizziness, mental confusion, central nervous system depression	180	0.79 (water)	2.5	12.8	NO	mint like 3 - 653 mg/m³	IRIS D	6.3	5.7	60	1.2	NE	1.31	9.69	58.1
Aluminum (metal dust)	7429-90-5	15 mg/m³ (T) 5 mg/m³ (R)	10 mg/m³ (T) 5 mg/m³ (R)	NE	Skin, respiratory, eyes	Inhalation, contact	Irritation of eyes, skin and respiratory system	0	2.7 (water)	NA	NA	NO	odorless	NE	NA	NA	NA	NA	NA	NA		26.98
Ammonia	7664-41-7	50 ppm S (35 ppm S)	25 ppm 35 ppm S	300 ppm	Eyes, skin, respiratory	Inhalation, ingestion, contact	Irritation of eyes, nose, throat, chest pain, pulmonary edema; skin burns; pink frothy sputum, breathing difficulties	6430	0.6 (air)	15	28	NO	sharp, cloying repellent 0.43 - 53 ppm	NE	0.3	NE	NE	NE	NE	NE	10.18	17
Antimony	7440-36-0	0.5 mg/m³	0.5 mg/m³	50 mg/m³	Eyes, skin, respiratory, cardiovascular	Inhalation, ingestion, contact	Irritation of eyes, skin, nose, throat, mouth; cough; dizziness; stomach cramps; unable to smell properly; vomiting; diarrhea; headache; anorexia	0	6.69 (water)	NA	NA	NO		NE	NA	NA	NA	NA	NA	NA		121.75
Arsenic (Inorganic)(Metal)	7440-38-2	0.01 mg/m³	0.01 mg/m³	5 mg/m³	Liver, kidneys, skin, lungs, lymphatic	Inhalation, absorption, contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, cancer, hyperpigmentation of the skin	0	5.73 (water)	NA	NA	NO	odorless	IRIS A1	NA	NA	NA	NA	NA	NA		74.9
Benzene	71-43-2	1 ppm 5 ppm S	0.3 ppm (a) 10 ppm	500 ppm	Eyes, skin, respiratory, blood, central nervous, bone marrow	Inhalation, absorption, ingestion, contact	Irritation of skin, nose, respiratory system; giddiness; headache; nausea; lassitude; bone marrow depression, fatigue, anorexia; dermatitis, leukemia	75	0.88 (water)	1.2	7.8	NO	aromatic 5 - 119 ppm	IRIS A	10	12.2	150	0.5	NE	0.56	9.24	78.1
Chromium (metal)	7440-47-3	1 mg/m³	0.5 mg/m³	250 mg/m³	Eyes, skin, respiratory	Inhalation, ingestion, contact	Irritation of eyes, skin, lung fibrosis	0	7.14 (water)	NA	NA	NO	odorless	NE	NA	NA	NA	NA	NA	NA		52
Copper (dust)	7440-50-8	1 mg/m³	1 mg/m³	100 mg/m³	Eyes, skin, respiratory, liver, kidneys	Inhalation, ingestion, contact	Irritation of eyes, nose, pharynx; nasal perforation, metallic taste, dermatitis, in animals: lung, liver, kidney damage; anemia	0	8.94 (in water)	NA	NA	NO	odorless	IRIS D	NA	NA	NA	NA	NA	NA		
Ethyl Benzene	100-41-4	100 ppm (125 ppm S)	100 ppm 125 ppm S	800 ppm	Eyes, skin, respiratory, central nervous	Inhalation, ingestion, contact	Irritation of eyes, skin, and mucous membrane; headache, dermatitis; necrosis; coma	7	0.87 (water)	0.8	6.7	NO	aromatic	IRIS D	NE	NE	100	0.6	NE	NE	8.76	106.2
Hydrogen Sulfide	7783-06-4	20 ppm C (10 ppm) (15 ppm S)	10 ppm 15 ppm S	100 ppm	Eyes, respiratory, central nervous	Inhalation, contact	Cessation of breathing, irritation of eyes, respiratory system, coma, convulsions; eye pain; tearing, visual intolerance to light; dizziness, headache; fatigue; irritability	17.6	1.19 (air)	4	44	NO	0.001-0.13 ppm quickly fatigues olfactory	NE	NE	NE	NE	NE	NE	NE	10.46	34.1
Lead (inorganic)	7439-92-1	0.05 mg/m³	0.05 mg/m³	100 mg/m³	Eyes, gastrointestinal tract, central nervous, kidneys, blood, gum tissue	Inhalation, ingestion, contact	Weakness, lassitude, insomnia, weight loss; constipation, abdominal pain; anemia; gum lead line; tremor; paralysis of wrist, ankles; encephalopathy; kidney disease; eye irritation, hypotension	0	11.34 (water)			NO	odorless	IRIS B2	NA	NA	NA	NA	NA	NA		207
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	0.01 mg/m³ 0.04 mg/m³ C (0.03 mg/m³ S)	0.01 mg/m³ 0.03 mg/m³ S	2 mg/m³	Eyes, skin, central nervous, peripheral nervous, kidneys	Inhalation, ingestion, absorption, contact	Numbness or tingling sensation, incoordination, vision and hearing disturbance, jerking limbs; dizziness; salivation; nausea; vomiting; diarrhea; constipation, skin burns; emotional disturbance, possible teratogenic effects	varies	varies			YES		IRIS D	NA	NA	NA <sub>1</sub>	NA	NA	NA		
Nickel (soluble salts)	7440-02-0	1 mg/m³ (0.1 mg/m³)	0.1 mg/m³ 0.05 mg/m³ (a)	10 mg/m³	Nasal cavities, lungs, skin	Inhalation, ingestion, contact	Sensitization dermatitis, allergic asthma, pneumonitis, cancer	0	8.9 (water)			NO	odorless	IRIS A1 (refinery dust)	NA	NA	NA <sub>1</sub>	NA	NA	NA		58.69
Toluene	108-88-3	200 ppm 300 ppm C (100 ppm ) (150 ppm S)	50 ppm	500 ppm	Eyes, skin, respiratory, central nervous, liver, kidneys	Inhalation, absorption, ingestion, contact	Irritation of eyes, nose; fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils, tearing; nervousness, muscle fatigue; dermatitis, liver and kidney damage	21	0.87 (water)	1.1	7.1	NO	sweet pungent 2.14 ppm	IRIS D	10	10	110	0.5	NE	NE	8.82	92
Trimethylbenzene 1,2,4-	95-63-6	(25 ppm)	25 ppm		Eyes, skin, respiratory, central nervous, blood	Inhalation, ingestion, contact	Irritation of skin, nose, throat, respiratory system, bronchitis; headache; drowsiness; fatigue, dizziness, nausea; incoordination; vomiting; confusion; chemical pneumonia	1	0.88 (water)	0.9	6.4	NO	distinctive aromatic odor	NE	NE	NE	NE	NE	NE	NE	8.27	120.2
Vinyl Chloride (Chloroethylene)	75-01-4	1 ppm 5 ppm C	5 ppm	NE	Liver, central nervous, blood, respiratory, lymphatic	Inhalation, contact	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, cyanosis of extremities	2508	2.21 (air)	3.6	33	NO	sweet, high threshold	IARC 1	5	NE	35	1.8	NE	2.14	9.99	62.5
Xylene, all isomers	1330-20-7	100 ppm (150 ppm S)	100 ppm 150 ppm S	900 ppm	Eyes, skin, respiratory, central nervous, gastrointestinal tract, blood, liver, kidneys	Inhalation, absorption, ingestion, contact	Irritation of eyes, skin, nose, throat; dizziness, excitement, drowsiness; incoordination; anorexia; nausea, vomiting; abdominal pain; dermatitis	7	0.86 (water)	1.1	7	NO	aromatic	IRIS D	11.2	NE	111	0.5	NE	0.4	8.56	106.2
Zinc Oxide Dust	1314-13-2	10 mg/m³ T 5 mg/m³ R	10 mg/m³	500 mg/m³	Respiratory	Inhalation	Metal fume fever, chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude, metallic taste, headache, blurred vision, low back pain, vomiting, fatigue, tight chest, breathing difficulty	0	5.61 (water)			NO	odorless	IRIS D	NA	NA	NA	NA	NA	NA		81.4
See Attached Notes								Note: Use P1/P101 + P201 to obtain values at 68F. Assume behaves as ideal gas	Note: Referenced to water at 39.2 F				Note: Used HSDB and 3M Resp. Selection Guide to obtain	Note: Use IRIS or IARC for consistency	Response Factors are from the manual. Can divide the response for benzene or isobutylene by response factor to get a correction factor	Response Factors are from the manual. Can divide the response for methane by response factor to get a correction factor	Data based on calibration with isobutylene. Multiply actual reading times this correction factor to obtain concentration for that gas.	Data based on calibration with isobutylene. Multiply actual reading times this correction factor to obtain concentration for that gas.				

TABLE 1 (Cont.)  
NOTES

( )	=	These are the 1989 Permissible exposure limits. They were vacated in 1994 and are no longer the legal limit.
a	=	These TLVs have not yet been adopted. ACGIH has placed them under notice of intended changes.
ACGIH	=	American Conference of Governmental Industrial Hygienists
b	=	The same information is listed for all Coal Tar Pitch Volatiles. The PEL/TLV is for all Coal Tar Pitch Volatiles combined. Separate PEL/TLVs have not been established to date
C	=	Ceiling Limit, shall not be exceeded at any time during the work day
CAS #	=	Chemical Abstracts Service Registry Number
D	=	Contaminant intake that should not induce adverse effects to human health or should not pose a risk of cancer occurrence greater than a predetermined risk level. Developed by US Army Medical Bioengineering R&D Laboratory. Expressed in mg/kg/day.
IARC	=	International Agency For Research on Cancer
IDLH	=	Immediately Dangerous to Life or Health
IRIS	=	Integrated Risk Information System
LOAEL	=	Lowest-Observed -Adverse Effect Level as determined by the USEPA/1989
LTE	=	Long Term Exposure Limit greater than 14 days as determined by USEPA/1989
MW	=	Molecular weight
mg/m <sup>3</sup>	=	milligrams of contaminant per cubic meter of air
NA	=	Not Applicable
NE	=	Not Established
OSHA	=	Occupational Safety and Health Administration
PEL	=	Permissible Exposure Limit, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), mandated by law
ppm	=	parts of contaminant per million parts of air
R	=	Respirable Dust
Rfd	=	Chronic Oral Reference Dose as determined by the USEPA/1989
S	=	Short Term Exposure Limit (STEL) usually 15 minutes, four times in one day
S/5/2	=	STEL for 5 minutes, twice per day
Skin Hazard	=	Contaminant can be absorbed through intact skin.
STE	=	Short Term Exposure less than 14 days for minimal risk other than cancer as determined by USEPA/1989
T	=	Total Dust
TLV	=	Threshold Limit Value, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), recommended
IRIS/IARC	Carcinogenic Category	
A1		Human Carcinogen
B1 2A		Probable Human Carcinogen (limited human data)
B2 2B		Probable Human Carcinogen (sufficient in animals, inadequate evidence in humans).
C 3		Possible Human Carcinogen
D4		Not Classifiable
E		Evidence of Non-Carcinogen

**4.2.1 Severe Weather**

Natural disasters may occur at the site due to weather. These include lightning, high winds and winter storm warnings.

- **Lightning:** Persons should not work in open areas, near trees or other equipment outside during lightning storms. Stop work until the storm passes. If possible, clear the site until the storm passes.
- **High Winds:** If high winds are forecast, then the site should be cleared before the winds become hazardous. Workers should be instructed to go to an appropriate shelter.
- If an evacuation is called, account for all persons before leaving the site.
- Notify the Project Manager of any work stoppage due to severe weather.
- **Winter Storm Warnings:** If storm warnings have been posted by local weather forecasters, work should be stopped before conditions become hazardous. Hazardous conditions include blizzard conditions, ice storms and severely low wind chills.

**4.3 BIOLOGICAL HAZARDS****4.3.1 Insects**

Numerous types of pest organisms may be present, including bees, mosquitoes, spiders and ticks. Field personnel are encouraged to use insect repellents before donning PPE. Also, field personnel may be required to wear knee high chemically resistant boots while at the Site to protect the feet and lower leg areas. A first aid kit, insect and tick repellent and treatment will be available for use in the field.

Stings of bees and wasps may cause serious allergic reactions in certain individuals. The SSO should identify all personnel with known insect allergies or sensitivities before field work begins.

Spider bites can be extremely serious, e.g., those of the black widow. Others are unpleasant or uncomfortable, resulting in rashes, itching and possible infection. The possibility of allergies greatly increases the danger since people are not usually aware of such allergies until they have been bitten. Therefore, spiders should be regarded as potentially hazardous. Ticks are parasites that feed on the blood of an animal/human host and can carry several diseases, the least bringing several days of fever and pain and the worst causing brain damage. Attachment B summarizes issues associated with ticks and tick borne disease.

**4.3.2 Other Animals**

Chipmunks, ground squirrels, rats and other mammals have been known to harbor fleas carrying bubonic plague. Their bites can also carry rabies and other infections. Chipmunk-like animals pose a special problem because people tend to try to feed them or pet them, the increased contact bringing greater possibility of danger. Avoid wildlife when possible.



Poisonous snakes may also be encountered on-site. Personnel should check for snakes before walking through grassy or debris-strewn areas. A snake bite should be included in the first aid kit.

### **4.3.3 Microorganisms**

Microbial action within the landfill is extensive, as demonstrated by elevated temperatures within the waste and the generation of methane. Some of these microorganisms may be capable of causing infection. Personnel sustaining lacerations or punctures from objects in the waste are at particular risk of infection. Attachment B summarizes issues with blood borne pathogens.

### **4.3.4 Poisonous Plants**

Poison ivy, poison oak, and poison sumac may be encountered while completing field activities. All of these plants secrete oils which can cause an itching rash which can spread.

The best defense against poisonous plants is to learn to identify them and ultimately, not come into contact with them. In summer months when leaves are present, if you cannot identify poisonous plants, avoid all three leafed plants. In the fall, spring and winter when leaves are not present, the stems of these plants can still release oils and cause the associated rashes.

If poisonous plants are likely to be, or have been, encountered then Technu pre-exposure or post-exposure lotion should be used. The lotion should be used to treat effected skin or cloths which have been in contact with the plants. Caution must be taken when removing clothing and shoes after going into areas with poisonous plants. Assume these items and your hands have oils from the poisonous plants on them. Wash hands and clothing with Technu lotion.

## **4.4 FLAMMABLE HAZARDS**

Flammable hazards are expected to be encountered during the course of this work due to the presence of methane gas. However, hydrogen sulfide, which is also flammable, may also be present. As a precaution, air monitoring, as specified in Section 6.0, will be conducted during all intrusive activities.

## **4.5 GENERAL EXPOSURE RISK**

Relative risk for site activities was determined by evaluating data from previous site activities and by compiling information or exposure levels from construction activities at the landfill.

### **4.5.1 Airborne**

While many of the chemicals of concern could pose a health threat, the level of worker exposure from airborne contaminants is expected to be low during the site construction activities. Air monitoring will be performed to verify actual exposure levels.

**4.5.2 Skin**

Skin contact is expected to pose the highest potential level of worker exposure as the field activity includes the handling of contaminated soil and groundwater material. This potential can be minimized by use of proper personal protection equipment (PPE) as discussed in Sections 5.0 and 7.0 through 9.0.

**4.5.3 Ingestion**

Accidental ingestion can be a significant route of entry for certain materials, including heavy metals such as arsenic. While the risk from contamination is low at this site, good practice includes washing before eating or smoking. Personal habits that allow hand to mouth contact, such as nail biting, shall be avoided.

**4.5.4 Persistence of Heavy Metals**

Certain chemical compounds, particularly the heavy metals, are very persistent in the environment. While the contamination level is expected to be well below TLV or PEL, the best approach is to minimize contamination beyond the work zone and avoid the possibility of taking contaminated soil home on boots or clothing. For example, it is recommended that excess dirt on work boots, hard hats, tools, etc., be removed before leaving the site.

## **5.1 MEDICAL EXAMINATION**

Before commencing any of the activities defined in Section 3.0, all personnel following the approved HASP must take a medical examination as part of a medical surveillance program. This medical surveillance program must meet the requirements of OSHA Regulations 29 CFR 1910.120(f). A summary of medical surveillance procedures is presented in Attachment B.

## **5.2 TRAINING**

All personnel working on-site and potentially exposed to hazardous substances, health hazards or safety hazards shall be thoroughly trained as specified in OSHA Regulations 29 CFR 1910.120(e). This training program will include: (1) attendance at an initial 40-hour basic health and safety training course off the Site; (2) a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor; (3) on-site, site-specific training; and (4) an 8-hour annual update in the basic health and safety training course.

On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations must have received: (1) 40 hours initial training (in accordance with OSHA Regulations 29 CFR 1910.120(e)); (2) three days of supervised field experience (3) 8 hours of site supervisor training and (4) additional training at the time of job assignment on such topics as, but not limited to: their company's safety and health program and the associated employee training program; personal protective equipment program; spill containment program; air quality monitoring; emergency response; monitoring equipment usage and calibration; and, health hazardous monitoring procedure and techniques.

Special training will be provided at the time of job assignment to on-site personnel who may be exposed to unique or special hazards not covered by the initial 40-hour basic health and safety course. Since it is not anticipated that any unique or special hazards will be encountered during this project, special training will not be required for the work activities covered by the approved HASP. If unique or special hazards are unexpectedly encountered, specialized training will be provided.

## **5.3 INCIDENT REPORTING**

Any incident or accident involving personnel working at this Site will require that a Hazardous Waste Incident Report be filed (Attachment B). Situations covered by this policy include, but are not limited to, fires, explosions, illnesses, injuries, and automobile accidents. These reports must be sent to the CHSO. Worker's Compensation Insurance reports for employees will be filed for each accident or illness which results from work related activities requiring medical attention. The SSO will complete a form for incident reporting in case of an incident.

**5.4 ILLUMINATION, SANITATION AND CONFINED SPACE ENTRY****5.4.1 Illumination**

All major work tasks are expected to occur during daylight hours. The illumination requirements set forth by OSHA Regulations 29 CFR 1910.120 (m) will be met for work after dark.

**5.4.2 Sanitation**

The sanitation requirements regarding potable and non-potable waters, toilet facilities and washing facilities will be followed as set forth in OSHA Regulations 29 CFR 1910.120(n). Food handling and temporary sleeping quarters requirements are not applicable to this site.

**5.4.3 Confined Space Entry**

Confined space entry will not be required in connection with the field work activities to be performed under this model HASP.

**5.5 WORK PROCEDURES**

Whenever possible, field personnel will work from a position upwind of work activities.

**5.6 RESPIRATOR MAINTENANCE, FITTING AND DECONTAMINATION**

Respirators, if used, will be cleaned daily according to procedures described herein. A summary of respirator fit testings, use and maintenance are summarized in Attachment B. Cartridges will be replaced either daily or if breakthrough is detected at any time while in use. The following checks will be performed on a daily basis in addition to the above:

- Exhalation valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve which could cause leakage
- Inhalation valves - screw off both cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place
- If full face respirators are worn, make sure a protective lens cover is attached to the lens
- Make sure you have the right cartridges
- Make sure that the face piece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment
- Make sure the speaking diaphragm retainer ring is hand tight

To don respirator, fit facepiece on nose bridge making sure that you are able to breathe through nose. Then swing bottom of facepiece into contact with the chin. When using elastic or rubber

headbands, position headbands with longest straps above the ears and over the crown of the head and headbands with shortest straps below the ears around nape of the neck. When using cradle headband, position cradle headband around the crown of the head; position bottom headbands below the ears and around the nape of the neck. Then, adjust the straps for a comfortable fit by moving adjustment slides to lengthen or shorten straps. Adjust the straps just snug enough so that no air leaks around the facepiece. It is not necessary to pull the straps so tight that the respirator digs into the face.

**THE RESPIRATOR MUST BE SUBJECTED TO THE FOLLOWING TIGHTNESS TEST BEFORE EACH USE.**

Test respirator for leakage using a positive pressure method. Lightly place palm over exhalation valve cover. Exhale gently. A slight positive pressure should build up inside the respirator. If any leakage is detected around the facial seal, readjust head harness straps and repeat test until there is no leakage. If other than facial seal leakage is detected, the condition must be investigated and corrected before another test is made. A negative pressure test will also be performed. Lightly place palms over cartridges or filter holders. Inhale gently and the facepiece shall collapse against the face. The respirator must pass the tightness tests before the respirator is used. The respirator will not furnish protection unless all inhaled air is drawn through suitable cartridges or filters.

To decontaminate respirators, the following steps should be undertaken:

- Wash with Alconox soap and water solution and brush gently to remove any soil/solid particulate matter that may have been collected on the respirator during field activities
- Rinse with distilled/deionized water, making sure that the inhalation and exhalation valves are clean and free of obstruction
- Rinse with distilled/deionized water
- Wipe with sanitizing solution to assure the sterility of the respirator
- Allow respirator to dry
- Place the respirator inside a sealed bag or a clean area away from extreme heat or cold

## **5.7 SITE SAFETY OFFICER NOTIFICATION**

All field personnel must inform the SSO or the Alternate SSO before entering the Site.

***IF ANY PREVIOUSLY UNIDENTIFIED POTENTIAL HAZARDS ARE DISCOVERED DURING ANY FIELD WORK, LEAVE THIS AREA OF THE SITE IMMEDIATELY AND CONTACT THE SSO FOR FURTHER INSTRUCTIONS.***

## **5.8 PROJECT SAFETY LOG**

A Project Safety Log will be used to record entry and exit dates and times of all field personnel and visitors to the Site; accidents, injuries, and illnesses; incidences of safety infractions by field personnel; air quality and personal exposure monitoring data; and other information related to safety matters. All accidents, illnesses, or other incidents are to be reported promptly to the SSO.

**5.9 OSHA INFORMATION POSTER**

In accordance with the Occupational Safety and Health Act of 1970, a copy of the OSHA information poster must be present at the Site. It will be posted at full size (11" x 17") in a permanent structure or temporary field office, or be distributed to on-site personnel in this model HASP. The Michigan Health and Safety Poster will also be posted/distributed at the beginning of field activities.

**5.10 PROHIBITIONS**

Smoking, eating, drinking, chewing tobacco or toothpicks, application of cosmetics, storing food or food containers, and having open fires will be permitted only in designated areas to be established by the SSO. Under no circumstance shall smoking, eating, drinking, chewing tobacco or toothpicks, or application of cosmetics be permitted in the Exclusion Zone or the Contamination Reduction Zone. Good personal hygiene shall be practiced by field personnel to avoid ingestion of contaminants.

**5.11 INITIAL SITE SAFETY MEETING AND SIGNING OF HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT**

The SSO will hold an initial site safety meeting with the Contractor and relevant subcontractors and other Contractor field personnel before work activities start at the Site. During this meeting, it will be verified that all personnel have been provided with or have reviewed an approved HASP for the work activities to be performed at this Site. For Contractor personnel, subcontractor personnel, and other contractor personnel whose employer(s) have submitted a HASP or adopted this model HASP, the HASP shall be reviewed, discussed and questions answered. Signed Health and Safety Plan Compliance Agreement Forms of personnel who will be following the approved HASP will be collected by the SSO and filed. Individuals refusing to sign the Form will not be allowed to work on the Site.

**5.12 SITE SAFETY BRIEFINGS**

During field operations, site safety briefings will be held at the start of each day by the SSO to review and plan specific health and safety aspects of scheduled work. All field personnel who are following the approved HASP are required to attend these briefings. Potential subjects that may be discussed are presented below:

1. Preliminary
  - Medical clearances
  - Training requirements
  - Written HASP availability
  - Designation of responsibilities for on-site personnel
  - Identification of on-site personnel trained and certified to administer First Aid

## 2. Training topics

- Review of HASP including:
  - types of hazards
  - pathways of exposure
  - levels of protection
  - contamination avoidance
  - prohibitions
  - work procedures
  - confined space entry
  - work zones
  - emergency response procedures
  - specific on-site area/work tasks of concern
- Decontamination.
- Personnel Protective Equipment.
- Air Quality Monitoring Program.
- How to Use Fire Extinguishers

## 3. Questions and Answers

Attachment B contains a form that all personnel will sign, indicating review of this HASP prior to working on-site.

**5.13 UNDERGROUND STRUCTURES**

Caution will be exercised whenever the possibility of encountering subsurface obstructions exists. Before beginning intrusive activities, all available sources of information (such as site utility drawings, public utility drawings, construction drawings, and discussions with former employees) will be reviewed. "Miss Dig", Michigan's Utility Locate Service will be notified at least 72 hours prior to undertaking any subsurface investigation. If underground obstructions are unexpectedly encountered, the area will be excavated using manual equipment until the nature of the obstruction is discerned.

## **SECTION SIX Air Quality Monitoring And Mitigative Measures For Control Of Emissions**

---

### **6.1 AIR QUALITY MONITORING INSTRUMENTATION**

While performing intrusive field activities at the Site, an air quality survey will be performed and the results will be recorded. Several instruments that may be used to monitor air quality are discussed below:

#### ***Photoionization Detector***

The HNu Systems Model PI-101 Photoionization Detector (HNu PID) or equivalent will be used at the discretion of the SSO to detect trace concentrations of certain organic gases and a few inorganic gases in the air. Methane, ethane, and the major components of air are not detected by the HNu PID. The HNu PID probe selected for this project is the 11.7 eV or equivalent, to quantify the group of contaminants of concern at the Site. The HNu PID detects mixtures of compounds simultaneously. HNu PID readings do not measure concentrations of any individual compound when a mixture of compounds are present.

The HNu PID will be calibrated twice each day (before start of work and at the conclusion of work) using an isobutylene standard for calibration. Calibrations will be documented. HNu PID readings will be measured in the breathing zone of the most highly exposed worker (i.e., closest to the source) at least hourly. This schedule may be reduced following characterization of the air and nature of the work.

Pertinent information concerning the methods and frequency of maintenance and calibration of the HNu PID are included in the manufacturer manual supplied with the instrument. Records of instrument calibrations, settings, and readings will be included in the field data book.

#### ***Organic Vapor Analyzer***

Monitoring for methane and organic vapors may be conducted using a organic vapor analyzer (OVA). The OVA is a flame ionization detector and will not function without sufficient oxygen. It is vital that frequent response checks be completed. In order to determine the concentration of methane, measure concentrations with a charcoal filter on and again in the same location with the filter off. Measurements must be made in quick succession to be comparable. The measurement with the filter on will indicate how much of a total OVA reading is caused by methane.

The OVA is to be calibrated each day prior to use. Calibrations are to be completed according to manufacturer's specifications using a known quantity (100 ppm) of methane in air. Whenever the OVA is in use it will be periodically response-checked using a felt tip marker to assure the flame is lit. OVA readings will periodically be taken in the breathing zone of personnel on-site. The OVA will be used at the discretion of the SSO.

The presence of methane at the site should be anticipated. Methane which is also known as marsh gas and methyl hydride, is a flammable, colorless, odorless and tasteless gas that is lighter than air and will accumulate in high places. It is a major constituent of natural gas. Methane is generated by the decomposition of organic materials within the landfill and is extremely flammable.



## **SECTION SIX Air Quality Monitoring And Mitigative Measures For Control Of Emissions**

---

### ***Combustible Gas Indicator/Oxygen Meter***

The Neotronics Exotox 40 Combustible Gas Indicator/Oxygen Meter (CGI) or equivalent may be used at the discretion of the SSO to measure the concentration of flammable vapors and gases, oxygen, and hydrogen sulfide (in addition to sulfur dioxide) in the air during field activities. Flammable gas concentrations are measured as percentages of the Lower Explosion Limit (LEL). Oxygen content is measured as a percentage of total air. Hydrogen sulfide concentration (which includes sulfur dioxide) is measured in parts per million.

Pertinent information concerning the methods and frequency of maintenance and calibration of the CGI are included in the manufacturer manual supplied with the instrument. Records of instrument readings shall be documented in the field data book.

### ***Multigas Detector Tubes***

Draeger Multigas Detector Tubes or equivalent will be used at the discretion of the SSO to detect and quantify the concentration of selected contaminants in the air. The detector tubes to be employed must be sensitive in the concentration ranges in the OSHA Permissible Exposure Limit (PEL) range for those contaminants. It should be realized that most "compound specific" detector tubes will also detect interference from other aromatic or aliphatic hydrocarbons; readings do not differentiate between which compounds are present. A Draeger pump and detector tubes for benzene, which has a relatively low OSHA PEL, hydrogen sulfide, sulfur dioxide and vinyl chloride may be used during field activities.

The tube readings will be compared to OSHA PELs to determine what level of protection is required. If HNu PID readings are elevated when compared to background (e.g. 4 ppm or more above background) or if phase product or odorous material is detected, then detector tubes for benzene will be employed. Detector tubes for hydrogen sulfide and sulfur dioxide will be employed when the hydrogen sulfide reading on the CGI exceeds 4 ppm.

Pertinent information concerning the Draeger Multigas Detector Tubes which may be used at the site can be obtained from supplier of tubes. Information concerning the use of Detector Tubes, including reasons for use, results of measurements and actions taken will be thoroughly documented in the SSO's daily inspection report.

### ***Personal Monitor for Aerosol and Dust***

The MIE, Inc. Model PDM-3 MiniRam Personal Monitor for Aerosol and Dust (MiniRam Monitor) or equivalent will be used at the discretion of the SSO to detect and quantify the concentration of fugitive dust that may be created during ground disrupting operations. The instrument is capable of measuring fugitive dust at concentrations as low as  $0.1 \text{ mg/m}^3$ .

The MiniRam Monitor will be calibrated twice daily, before start of work and at the conclusion of work. Pertinent information concerning the methods and frequency of maintenance and calibration of the MiniRam Monitor are included with the instrument package. Recording instrument readings will be contained in the field book.

## SECTION SIX Air Quality Monitoring And Mitigative Measures For Control Of Emissions

### 6.2 AIR QUALITY RESPONSE LEVELS

A number of response levels will be used during field work if contamination is encountered during air monitoring. The CHSO will be notified as soon as practical of upgrading from the initial levels of protection. The following response are suggested for the work activities covered by this HASP.

During well installation and removal, either an OVA or combustible gas indicator will be used to monitor for methane and other potential flammable gases. Due to no significant levels of VOCs having been found in groundwater samples collected to this time; combined with no elevated levels of VOCs being detected in the breathing zone during monitoring well installation and groundwater sampling (Final Report Pre-Design Studies, Albion-Sheridan Township Landfill, Calhoun County, MI, Woodward-Clyde Consultants, November, 1996); air monitoring will not be required during these activities or other activities where there are no significant intrusive activities.

#### Air Quality Measurement<sup>(1)</sup>

#### Response

HNu PID reading less than 5 ppm  
above background (1 min average)

CGI reading less than 10% LEL

Oxygen reading greater than 19.5%  
and less than 21%

Hydrogen sulfide reading less  
than 5 ppm (CGI and Draeger Detector  
Tubes)

Benzene reading less than 0.5 ppm and vinyl  
chloride reading less than 0.5 ppm  
(Draeger Detector Tubes)

MiniRam Monitor reading less  
than 2.5 mg/m<sup>3</sup>

Level D Protection  
or Modified Level D Protection  
(at the discretion of the SSO)

HNu PID reading greater than 5 ppm  
and less than 10 ppm above background  
(1 min average)

Benzene reading greater than 0.5 ppm  
and less than 5 ppm (Draeger  
Detector Tube)

MiniRam Monitor reading greater  
than 2.5 mg/m<sup>3</sup> and less than 10 mg/m<sup>3</sup>

Level C Protection

HNu PID reading greater than  
10 ppm above background (1 min average)  
Benzene reading greater the 5 ppm

Level B Protection

## **SECTION SIX Air Quality Monitoring And Mitigative Measures For Control Of Emissions**

(Draeger Detector Tube)

Oxygen reading less than 19.5%  
or greater than 21%

Hydrogen sulfide reading greater than 5 ppm

(CGI and/or Draeger Detector Tube)

MiniRam Monitor reading greater than  
10 mg/m<sup>3</sup>

Vinyl chloride reading greater than 0.5 ppm  
(Draeger Detector Tube)

Suspend work in immediate area and notify  
CHSO and Project Manager. Conduct air  
monitoring periodically to determine when  
work may be continued. Take mitigative  
measures as discussed in Section 6.  
to suppress emissions as appropriate.

CGI reading greater than 10% LEL

All ignition sources will be shut off.  
The work zones will be evacuated  
immediately. Work will not resume  
until the CGI readings are continuously  
below 10% LEL for 15 minutes or more.

(1) All Air Quality Measurements, with the exception of CGI measurements for flammable vapors and gases, shall be made in the breathing zone of personnel who, in the opinion of the SSO, are most exposed to airborne contaminants. Measurements of flammable vapor and gas levels will be made in the vicinity of the nearest ignition source.

Background HNu PID readings will be taken at least twice per day (before start of work and at the conclusion of work). Background levels will be taken at a location which is not affected by on-site work. Once work at the Site begins, relocation of the original background location may be required.

Should work at the Site be conducted using respiratory protection, the need for a personal exposure monitoring program will be evaluated by the CHSO. Details of this program and any monitoring equipment required for its implementation will be specified in an Addendum to this HASP prepared by the CHSO.

Air monitoring will follow the guidelines presented in Section 6.2. In general, air monitoring will initially be undertaken exclusively in the work area and in any immediate area where there is potential risk for chemical exposure or ignition of flammable gas. In the event that chemical levels in work areas require the upgrade of PPE from level "D" to level "C" or level "B", fence line monitoring will be required concurrently with monitoring within the exclusion zone.

Fence line monitoring will consist of the same requirements as those in the work zone. However, there will be no option to upgrade PPE based on elevated air readings at the fence line.

If the fence line PID or OVA reads above 1 ppm, Draeger Tube sampling for benzene and vinyl chloride will commence. If Draeger tube results for either of these two compounds ever exceeds 0.5 ppm, at the fence line, work will cease until levels have dropped below this level for a minimum of one half hour.

Monitoring of the fence line for a flammable atmosphere (LEL, % oxygen, etc.) will not be required as abnormal readings of these parameters in the exclusion zone will require cessation of work.

## **SECTION SIX Air Quality Monitoring And Mitigative Measures For Control Of Emissions**

---

### **6.3 AIR MONITORING REQUIREMENTS DURING REMEDIAL ACTIONS**

#### **6.3.1 Drum Removal and Treatment**

In addition to personnel monitoring, drum removal activities will require:

- Fenceline air sampling in a downwind location for specific VOC compounds using Draeger Tubes
- Routine monitoring with a 11.7 eV Hnu

#### **6.3.2 Landfill Cap Construction**

In addition to personnel monitoring, landfill cap construction/site grading activities will require:

- Routine fenceline air monitoring with a 11.7 eV Hnu when waste is exposed

#### **6.3.3 Landfill Gas Collection System Construction**

In addition to personnel monitoring, landfill gas collection system installation will require:

- Routine fenceline air monitoring with a 11.7 eV Hnu

The O&M Contractors HASP will include provisions to sample, following completion of the Prefinal Construction Inspection, three locations (two vents located in areas of greatest waste thickness and one downwind fenceline location) for specific VOC analysis to determine the concentration of specific VOCs in the landfill gas. Methane monitoring and flow rate measurements from all gas vents will be completed on a quarterly basis.

### **6.4 MITIGATIVE MEASURES FOR CONTROL OF EMISSIONS**

Vapor emissions resulting from field operations, if they were to occur, are not anticipated to exceed the action levels. If the action levels are exceeded at any monitoring location, implementation of mitigative measures to suppress emissions will be investigated. Appropriate mitigative measures would include ceasing operations until the exact cause of the emissions could be identified and corrected. Vapor control actions may include vapor suppression foams, covering exposed soil piles with plastic sheeting and/or spraying exposed soil piles with water.

**7.1 DESCRIPTION OF LEVELS OF PROTECTION**

The personal protection equipment specified in this HASP will be available to all field personnel. The following requirements will be followed in accordance with OSHA Regulations:

- facial hair will not interfere with the proper fit of respirators
- contact lenses will not be worn
- eyeglasses that interfere with the proper fit of full-face respirators will not be worn

**Level D Personal Protective Equipment**

- Hard hat (when heavy equipment is in use)
- Safety glasses or goggles
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"<sup>(1)</sup>

<sup>(1)</sup> *Choice at discretion of SSO*

**Modified Level D Personal Protective Equipment**

- Hard hat (when heavy equipment is in use)
- Safety glasses or goggles
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Regular Tyvek® coveralls<sup>(1)</sup>
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"
- Nitrile-butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Polyethylene coated or Saranex® impregnated Tyvek® coveralls<sup>(1)</sup> (taped at cuffs)

<sup>(1)</sup> *Choice at discretion of SSO*

**Level C Personal Protective Equipment**

- Hard hat (when heavy equipment is in use)
- Full-face MSA respirator with organic vapor/acid gas/HEPA combination cartridges
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Regular Tyvek® coveralls<sup>(1)</sup>
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"
- Nitrile-butadiene rubber outer gloves

- Latex surgical gloves (to be worn underneath outer gloves)
- Polyethylene coated or Saranex® impregnated Tyvek® coveralls<sup>(1)</sup> (taped at cuffs)

<sup>(1)</sup> *Choice at discretion of SSO*

Air monitoring equipment described previously will be provided. A first aid kit, and eye wash station will be present and maintained at the Site.

Selection of the PPE specified for this project is based on a review of the identified or suspected hazards, routes of potential exposure to on-site workers (inhalation, skin absorption, ingestion, and skin or eye contact) and the performance of the personal protective equipment in providing a barrier to these hazards. In addition, the choice of PPE has been reviewed to match the work requirements and task-specific conditions to provide adequate protection without causing unnecessary physical impairment to the worker.

## **7.2 INITIAL PPE LEVELS FOR SPECIFIC WORK TASKS**

Level D PPE has been established for initial work activities described in Section 3.0. It is the responsibility of the SSO to determine if a PPE upgrade is warranted based on air monitoring results.

To minimize the movement of contaminants from the Site to uncontaminated areas, three work zones will be set up. The three work zones will consist of the following:

- Zone 1:       Exclusion Zone
- Zone 2:       Contamination Reduction Zone
- Zone 3:       Support Zone

The Exclusion Zone is the area where contamination occurs or could occur. Initially, the Exclusion Zone should extend a distance of 25 ft from the edge of intrusive activity unless conditions at the Site warrant either a larger or smaller distance as determined by the SSO. All persons entering the Exclusion Zone must wear the applicable level of protection as set forth in Section 7.1, Personal Protective Equipment and Section 7.2, Initial PPE Levels for Specific Work Tasks. It is anticipated that work zones will be established at each individual area of intrusive work rather than encompass the entire Site.

The Support Zone is the area of the Site where significant exposure to contamination is not expected to occur during non-intrusive activities. The Support Zone is considered to be the "clean area" of the Site.

Between the Exclusion Zone and Support Zone is the Contamination Reduction Zone which provides a transition zone between the contaminated and clean areas of the Site. The Contamination Reduction Zone will be located directly outside of the Exclusion Zone. All personnel must decontaminate when leaving the Exclusion Zone. A Contamination Reduction Zone (decontamination area) will be established adjacent to each individual area of intrusive work.

The following steps will be taken for decontamination of personnel:

- Deposit equipment that needs to be decontaminated on plastic drop cloths
- Wash boots and outer gloves with long handled brushes in wash tub containing Alconox and water
- Rinse boots and outer gloves with long handled brushes in a wash tub containing clear water or use a sprayer to rinse off boots and gloves
- Remove tape and place in disposal drum
- Remove outer gloves and place in disposal drum
- Remove suit and place in disposal drum
- Remove respirator and place on table to be decontaminated
- Remove inner gloves and place in disposal drum
- Wash hands and face

All tools or equipment which have been in contact with contaminated materials shall be decontaminated after leaving the Exclusion Zone. This decontamination is to be performed using a high pressure/hot water "steam type" cleaner or a spray/rinse decontamination sequence as described in Section 5.6, Respirator Maintenance, Fitting and Decontamination, as appropriate.

Contaminated liquids from the decontamination area and contaminated clothing will be disposed of in accordance with site protocols.



The purpose of this section of the HASP is to address how personnel at the Site will respond to emergencies. The types of potential emergencies that are addressed by this Plan include:

- Fires
- Chemical exposures
- Physical injuries

Decontamination procedures as specified in Section 9.0 will be followed to prevent the spread of contamination off-site.

## **10.1 EMERGENCY RECOGNITION AND PREVENTION**

### ***Purpose***

The purpose of the Emergency Response Plan is to have a detailed pre-determined strategy for handling emergency incidents and potential problems. This pre-emergency planning will aid in immediate response and abatement of problems and will likely reduce the severity and impact of the situation. The plan is designed to protect site personnel and the public from potential hazards created by an emergency situation.

It is critical that key personnel are informed immediately of emergency situations so that response efforts can be carried out effectively. Teamwork is crucial for abating hazards and minimizing damage. Emergency assistance should always be requested when it is unclear whether there is a need for support personnel. This section details procedures to be followed during an emergency. A summary of emergency procedure requirements is also presented in Attachment B.

### ***Responsibilities***

On-site Supervisor: The On-site Supervisor (OS) shall be responsible for the overall direction and implementation of this ERP, and for overall coordination of any emergency response actions. The OS is responsible for notifying the appropriate outside emergency assistance, as needed, in the event of an emergency.

Site Safety Officer: The Site Safety Officer (SSO) shall serve as assistant and alternate to the OS and shall provide health and safety input during emergencies.

### ***Recognition***

Emergency situations can easily be recognized by visual observations, worker complaints or monitoring instruments. A chemical release shall be considered an emergency when it is sufficient to affect unprotected personnel, including site workers and the public. Action level response items listed in Section 6.2 must be followed.

***Response Procedures***

The information in this section is presented as a guideline to assist the OS and SSO in safe and effective response to anticipated site emergencies. This information is not designed to take the place of reasonable decisions based on incident-specific information.

**I. First Priority**

Prevent further injury or illness by:

- Evacuate to a safe area
- Protecting response personnel
- Isolating the scene to authorized personnel only
- Rescuing the injured parties
- Notifying Outside Emergency Assistance

**II. Second Priority**

Provide first-aid to those persons with life threatening injuries or illnesses.

**III. Third Priority**

Alleviate the immediate hazards by:

- Extinguishing incipient stage fires: Use a Class A, B Fire Extinguisher and approach from upwind side. If the fire has moved of its incipient stage to an uncontrolled burn or if upwind approach is not possible, do not attempt to extinguish the flames.
- Contain, move or minimize hazard if able to do so without endangering personnel.
- Reducing chemical releases.

**IV. Fourth Priority**

Provide first-aid to those persons with non-life threatening injuries or illnesses and further efforts to alleviate the hazard.

**V. Notification - Last Priority**

Notify the Contracting Officer by telephone immediately and provide a written report within 24 hours of the occurrence. Complete a Supervisor's Accident Report (Appendix B), critique the response and prevent recurrence.

***Safe Refuge***

Initially, all personnel should report to a preselected staging area/project office for safe refuge. A more distant location may be determined as the emergency is being evaluated.

***Site Security and Control***

Access to the site will be controlled by the Project Manager or his designee at the entrance gate.

**10.1.1 Fires**

Fires are possible whenever flammable gases or vapors are present in proper concentrations and an ignition source is present. The construction equipment itself provides an ignition source. To prevent fires, a CGI as specified in Section 6.0 will be used to detect flammable concentrations of gases or vapors. Ignition sources will be turned off and the area evacuated if vapors or gases reach 10% of the Lower Explosion Limit (LEL) as measured by the CGI. Work will not resume until the SSO observes CGI readings below 10% of the LEL for a minimum of 15 consecutive minutes. A minimum of one twenty pound fire extinguisher will be present on-site. Personnel will be trained in the use of the fire extinguisher at the initial site safety meeting.

**10.1.2 Chemical Exposures**

Work will always be performed in a manner that minimizes exposure to contaminants through skin or eye contact, inhalation or ingestion. Work practices that shall be followed to reduce the risk of chemical exposure include:

- PPE, as specified in Section 7.0, for the appropriate work activities and areas as defined by the SSO, will be used by all field personnel following this HASP. A formal revision to the HASP must be made by the CHSO to modify the PPE specifications
- Keep hands away from face during work activities
- Minimize all skin and eye contact with contaminants

Early recognition of the symptoms of chemical exposure is essential for the prevention of serious chemical exposure incidents. Symptoms of exposure to the types of compounds potentially present at the Site include the following: fatigue, weakness; eye, nose, and/or throat irritation; headache; dizziness; nausea; vomiting; malaise; tremors; aggressive confusion; cyanosis (blue color to skin); anemia; and muscle spasms. If a person experiences any of these symptoms, or others, or recognizes any of the symptoms in a fellow worker, the person experiencing the symptoms shall immediately stop work and report his or her symptoms to the SSO. If the symptoms persist or appear to be damaging in any way, the SSO will make arrangements to take the individual to a hospital for medical treatment. If the symptoms are serious, work activities in the area where the person was exposed will be discontinued until more is known about the incident. Incident reporting procedures as specified in Section 5.3 will be initiated.

**10.1.3 Physical Injuries**

Site personnel will constantly look for potential safety hazards such as holes or ditches; improperly positioned objects, such as drums or equipment that may fall; sharp objects, such as nails, metal shards, and broken glass; protruding objects at eye or head level; slippery surfaces; steep grades; uneven terrain or unstable surfaces, such as walls that may cave in or flooring that may give way. Site personnel shall inform the SSO of any potential hazards observed so that corrective action can be taken.

**10.2 MODEL CONTINGENCY PLAN**

The Model Contingency Plan which describes measures and procedures to be used in the event of an accident or emergency at the site are detailed below for the Contractors consideration. The final Contingency Plan will be included in the site-specific HASP. The plan is prepared in accordance with Section III of the SOW.

**10.2.1 Contingency and Emergency Response Plan**

Before work commences at the site, the Contractor shall be required to develop contingency plans including excavation procedures and routes to places of refuge or safe distances from the danger area, for the following potential emergencies.

- Chemical exposure
- Personal injury
- Potential or actual fire or explosion
- Environmental accident (spill or release)
- Discovery of radioactive material

In the event of any emergency associated with remedial action, the Contractor shall without delay take diligent action to remove or otherwise minimize the cause of the emergency, alert the Engineer and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

The emergency response and contingency plan for on-site and off-site emergencies shall be prepared as specified in OSHA 29 CFR 1910.120(1), which shall address at a minimum:

- Name of person responsible for response in case of an emergency.
- Personnel roles, lines of authority, training and communication.
- Emergency recognition and prevention.
- Plan dates of meeting with local community, State and Federal agencies, and the local emergency squads.
- Site security and control.
- Evacuation routes and procedures.
- Decontamination.
- Emergency medical treatment and first aid.
- Emergency alerting and response procedures.
- Directions to the medical facility.
- Personal Protection Equipment (PPE) and emergency equipment.
- Air Monitoring Plan (from the design package).

In the event of an emergency, the Contractor shall without delay: take diligent action to remove or otherwise minimize the cause of the emergency, alert the Engineer and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

Emergency medical care services shall be prearranged at a nearby medical facility with established emergency routes. The staff at the facility shall be advised of the potential medical emergencies that might results and that the patients clothing and skin may be contaminated.

The Contractor shall establish emergency communications with health and emergency services. The name of this facility, name of contact, emergency routes and emergency communications arrangements shall be posted at the site. The posted list shall include the following minimum points:

- Contractor physician name, address and telephone number.
- Ambulance services and fire department telephone numbers.
- Procedure for prompt notification of Engineer and MDEQ.
- Location of emergency showers/eye lavages.
- Location of self-contained breathing devices.
- Specific procedures for handling personnel with excessive exposure to chemicals or contaminated soils.
- All emergency contact names and telephone numbers shall be posted at all project phones.
- All site support vehicles shall be equipped with route maps providing directions to the off-site medical facility. All drivers of support vehicles shall become familiar with the emergency route and the travel time required.

In the event that an accident or some other incident such as an explosion, a theft of any hazardous material, or an exposure to toxic chemical levels occurs during the course of the project, the Engineer shall be telephoned immediately and receive a written notification within 24 hours. The report shall include the following items:

- Name, organization, telephone number, and location of the Contractor.
- Name and title of the person(s) reporting.
- Date and time of accident/incident.
- Location of accident/incident, including site location and facility name.
- Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident.
- Cause of accident/incident, if known.
- Casualties (fatalities, disabling injuries).
- Details of any existing chemical hazard or contamination.

- Estimated property damage, if applicable.
- Nature of damage; effect on contract schedule.
- Action taken by Contractor to insure safety and security.
- Other damages or injuries sustained (public or private).

### **10.2.2 Spill Response**

Drums of solid and liquid materials may be excavated. The following procedures will be implemented in the event of a spill of contaminated groundwater or chemical product:

Notify other on-site personnel of the incident. Call for emergency assistance for fires and large spills. Personnel will only respond to small leaks and fires.

Approach spill area from an upwind location and conduct air monitoring, as appropriate. Proceed if air monitoring indicates it is safe (See Section 6.2 for action levels).

Conduct response appropriate for the product or contaminant and the incident as described below.

Complete incident report forms to document the incident.

### ***Liquid Spills from Drums***

#### **Spills**

- Eliminate all ignition sources
- Do not touch or walk through material
- Stop leak if you can do so without risk
- Use a non-combustible material such as sand, dirt or vermiculite to soak up spill
- Use clean, nonsparking tools to pick up absorbed material

#### **Fire - Highly flammable; Very low flash point**

Use dry chemical, CO2 or regular foam. Vapors may travel to source or ignition and flash back. Vapors may form explosives mixtures with air. Vapors are heavier than air, will stay low to the ground or sink. Containers may explode when heated.

### ***Contaminated Groundwater***

#### **Spills**

- Eliminate all ignition sources
- Stop leak if you can do so without risk
- Use a non-combustible material such as sand, dirt or vermiculite to soak up spill

Fire

Dry chemical, CO2 or water spray

**10.3 EMERGENCY ALERTING PROCEDURES**

The SSO will alert the appropriate work groups when an emergency occurs through the use of radios or by directly contacting the work group. The SSO and any isolated work group will carry radios if direct contact cannot be maintained. A single blast from an air horn will be used to signal workers to stop work and assemble in the Contamination Reduction Zone. If evacuation of the Site is necessary, three blasts from an air horn will be used to signal workers.

**10.4 EVACUATION PROCEDURES AND ROUTES**

Normally, personnel should evacuate through the Contamination Reduction Zone, and from there, to the Support Zone. If a fire blocks entry into the Contamination Reduction Zone, personnel will proceed directly to the Support Zone. Evacuation from the Contamination Reduction Zone will proceed in an upwind direction from the emergency. If evacuation to the Support Zone does not provide sufficient protection from the emergency, personnel will be advised to evacuate the Site proper.

**10.5 TELEPHONE NUMBERS OF EMERGENCY SERVICES**

The telephone numbers of local emergency services are given below.

<u>Emergency Service</u>	<u>Telephone Number</u>
Ambulance (EMS)	(517) 629-9431
Fire Department	(517) 629-3933
Police Department	(517) 629-3933
Albion Community Hospital	(517) 629-2191
Poison Control Center	(800) 442-4571
U.S. EPA National Response Center	(800) 438-2427

These telephone numbers must be verified by the SSO prior to the start of fieldwork. The ambulance, fire and police departments are all available by dialing **911**.

**10.6 EMERGENCY RESPONSE PERSONNEL**

The SSO will have the primary role in responding to all emergencies at the Site. The SSO, or the Alternate SSO, will be present at the Site during all work activities. If any emergency such as a fire, chemical exposure, or physical injury occurs, the SSO shall be notified immediately. All site personnel will take direction from the SSO in cases of emergency response.

After an emergency has occurred at the Site, the causes and responses to that emergency shall be thoroughly investigated and documented by the Project Manager and SSO; this documentation will be submitted to the Corporate Health and Safety Administrator and CHSO.

### **10.7 DECONTAMINATION PROCEDURES DURING AN EMERGENCY**

Decontamination of an injured or exposed worker or during a site emergency shall be performed only if decontamination does not interfere with essential treatment or evacuation.

If a worker has been injured or exposed and decontamination can be done: wash, rinse, and/or cut off protective clothing and equipment.

If a worker has been injured or exposed and decontamination cannot be done:

- Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel
- Alert emergency and off-site medical personnel to potential contamination
- Have the SSO or other personnel familiar with the incident and contaminants at the Site accompany the victim to the hospital

### **10.8 EMERGENCY MEDICAL TREATMENT AND FIRST AID RECOMMENDED PROCEDURES**

Emergency medical treatment or First Aid may be administered at the Site by the SSO or other personnel who have been certified in First Aid.

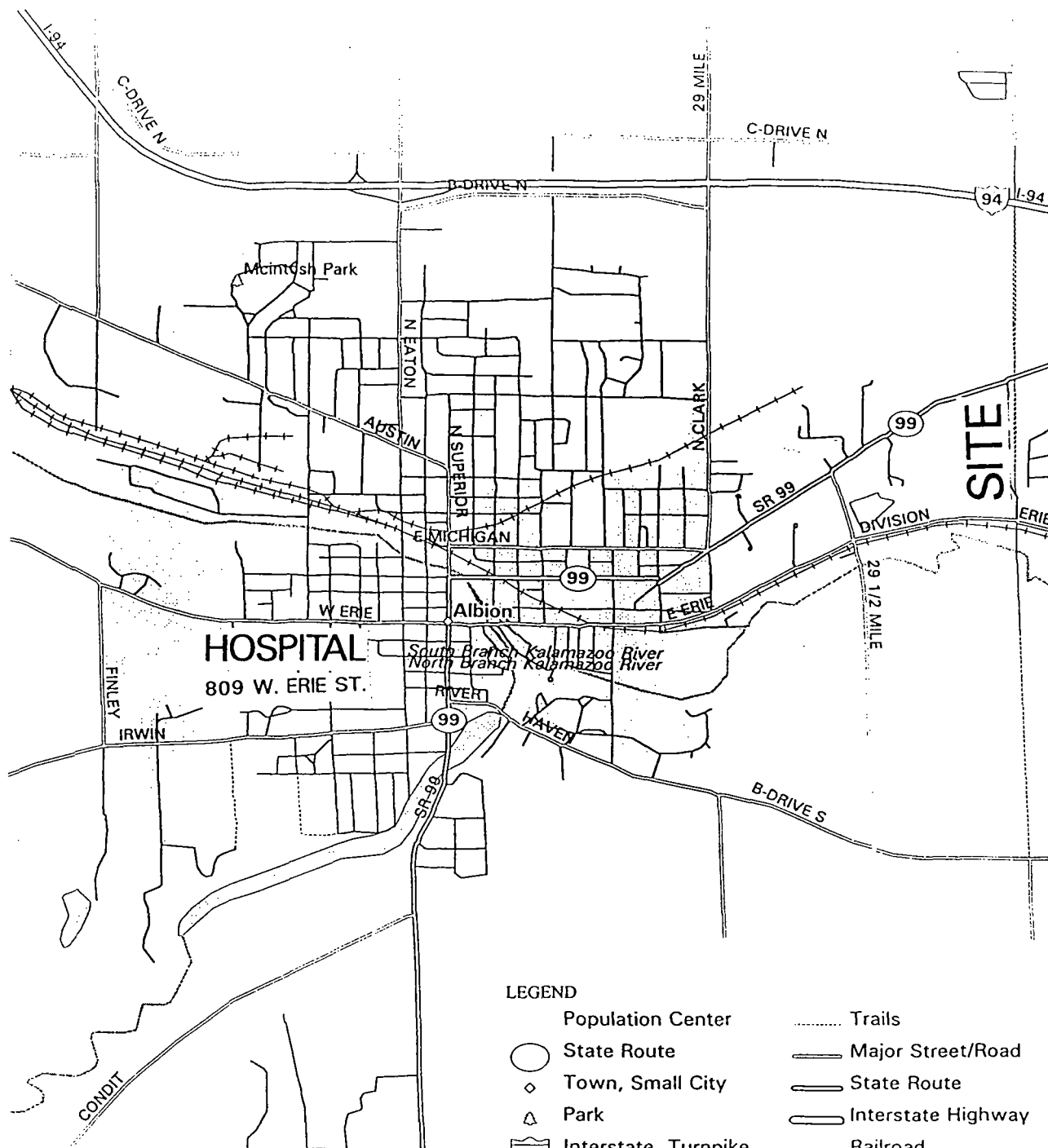
General emergency medical and First Aid procedures are as follows:

- Remove the injured or exposed person(s) from immediate danger
- Render First Aid, if necessary, decontaminate affected personnel, if necessary
- Call an ambulance for transport to local hospital immediately, this procedure should be followed even if there is no apparent serious injury
- Evacuate other personnel at the Site to safe places until the SSO determines that it is safe for work to resume
- Report the accident to the CHSO immediately

### **10.9 DIRECTIONS TO THE ALBION COMMUNITY HOSPITAL FROM SITE**

- Go west on East Erie Road which will turn into West Erie Street at Superior
- After one stop sign and two traffic lights (from the site), you will see Albion Community Hospital on the left side of West Erie Street (8 blocks past second stoplight)
- Albion Community Hospital is located at 809 West Erie Street, Albion, MI 49224





Scale 1:31,250 (at center)  
2000 Feet

1000 Meters

Mag 14.00  
Thu May 30 09:48:43 1996

#### LEGEND

- |                      |                    |
|----------------------|--------------------|
| Population Center    | Trails             |
| State Route          | Major Street/Road  |
| Town, Small City     | State Route        |
| Park                 | Interstate Highway |
| Interstate, Turnpike | Railroad           |
| County Boundary      | River              |
| Street, Road         | Open Water         |
| Hwy Ramps            |                    |



**Woodward-Clyde Consultants**

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

#### HOSPITAL LOCATION MAP ALBION-SHERIDAN TOWNSHIP LANDFILL ALBION, MICHIGAN

DRN BY: SWH

DATE: MAY 1996

PROJECT NO.

FIG. NO.

CHK'D BY: DS

DATE: MAY 1996

6E07013

2

Directions to the Albion Community Hospital from the Site must be verified by the SSO prior to the start of field work.

### **10.9.1 Notification of Michigan OSHA**

In the event that 3 or more persons are injured, or one or more fatalities occur on the job site, Michigan OSHA must be notified within 8 hours. Michigan OSHA can be reached at (517) 322-1297.

## **SECTION ELEVEN**

### **Geotechnical Laboratory Considerations**

---

In accordance with the requirements of OSHA Regulations 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories, and the Hazardous Waste Health and Safety Manual, a Chemical Hygiene Plan must be prepared and approved by the CHSO prior to transporting any potentially contaminated sample to an analytical laboratory.

### **12.1 PROJECT PERSONNEL**

Personnel authorized to enter the Site and work on this project subject to compliance with provisions of the HASP, are:

- Project Manager
- Site Safety Officer
- Corporate Health and Safety Officer

Other personnel who meet the model HASP requirements, including training and participation in a medical surveillance program, may enter and work on the Site subject to compliance with provisions of the model HASP.

### **12.2 PROJECT SAFETY RESPONSIBILITIES**

Personnel responsible for implementing a Health and Safety Plan are the Project Manager and the Site Safety Officer.

## SECTION THIRTEEN

## Health And Safety Plan Approvals

---

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Corporate Health and Safety Manager

\_\_\_\_\_  
Date

## SECTION FOURTEEN

## Health And Safety Plan Compliance Agreement

---

I, \_\_\_\_\_ (print name), have received a copy of the Health and Safety Plan for the Albion-Sheridan Township Landfill in Albion, Michigan. (Project No.: \_\_\_\_\_), dated \_\_\_\_\_. I have read the HASP, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the Health and Safety Plan.

Signed:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Company







**ATTACHMENT A**  
**MSDS SHEETS**

---

# Material Safety Data Sheet

From Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 385

ETHYL BENZENE

(Revision A)

Issued: August 1978

Revised: November 1988

## SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol;  $C_8H_{10}$ ; CAS No. 0100-41-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.



NFPA

HMIS

H 2

F 3

R 0

PPG\*

\*Sec sect. 8

R 1

I 3

S 2

K 4

## SECTION 2. INGREDIENTS AND HAZARDS

%

## EXPOSURE LIMITS

Ethyl Benzene, CAS No. 0100-41-4

Ca 100

OSHA PELs

8-Hr TWA: 100 ppm, 435 mg/m<sup>3</sup>

15- Min STEL: 125 ppm, 545 mg/m<sup>3</sup>

ACGIH TLVs, 1988-89

TLV-TWA: 100 ppm, 435 mg/m<sup>3</sup>

TLV-STEL: 125 ppm, 545 mg/m<sup>3</sup>

Toxicity Data\*

Human, Inhalation, TC<sub>50</sub>: 100 ppm (8 Hrs)

Rat, Oral, LD<sub>50</sub>: 3500 mg/kg

See NIOSH, RTECS (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.

## SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)

Melting Point: -139°F (-95°C)

Vapor Pressure: 7.1 Torrs at 68°F (20°C)

Vapor Density (Air = 1): 3.7

% Volatile by Volume: Ca 100

Molecular Weight: 106 Grams/Mole

Solubility in Water (%): Slight

Specific Gravity (H<sub>2</sub>O = 1): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

## SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 64°F (18°C) CC

Autoignition Temperature: 810°F (432.22°C)

LEL: 1% v/v

UEL: 6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. Unusual Fire or Explosion Hazards: This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

## SECTION 5. REACTIVITY DATA

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. Conditions to Avoid: Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. Hazardous Products of Decomposition: Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

## SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspiring even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, and CNS. Primary Entry: Inhalation, skin contact. Acute Effects: Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm disturbance, pulmonary and laryngeal edema; euphoria; headache; giddiness; dizziness;

# Material Safety Data Sheet

From Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 52

HYDROGEN SULFIDE  
(Revision A)  
Issued: July 1979  
Revised: April 1988

## SECTION 1. MATERIAL IDENTIFICATION

25

Material Name: HYDROGEN SULFIDE

Description (Origin/Uses): Used as a reagent in analytical chemistry and in metallurgy; used to make heavy water.

Other Designations: Sulfureted Hydrogen;  $H_2S$ ; NIOSH RTECS No. MX1225000; CAS No. 7783-06-4

HMIS

H 4

F 4

R 3

PPG\*

\*See sect. 8

R 1

I 3

S 2

K 4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.



## SECTION 2. INGREDIENTS AND HAZARDS

%

## EXPOSURE LIMITS

Hydrogen Sulfide, CAS No. 7783-06-4

IDLH\*\* Level: 300 ppm

\*Contact your supplier to determine the exact composition of this gas and if any contaminants are present.

\*\*Immediately dangerous to life and health.

\*\*\*OSHA sets the maximum peak above ceiling PEL as 50 ppm only in an 8-hour shift with no other measurable exposures.

\*\*\*\*See NIOSH, RTECS, for additional data.

OSHA PEL

Ceiling:\*\*\* 20 ppm

ACGIH TLVs, 1987-88

TLV-TWA: 10 ppm, 14 mg/m<sup>3</sup>

TLV-STEL: 15 ppm, 21 mg/m<sup>3</sup>

NIOSH REL

10-Min Ceiling: 10 ppm, 15 mg/m<sup>3</sup>

Toxicity Data\*\*\*\*

Human, Inhalation, LC<sub>50</sub>: 600 ppm (30 Mins)

## SECTION 3. PHYSICAL DATA

Boiling Point: -76°F (-60°C)

Melting Point: -117°F (-83°C)

Vapor Density: 1.2

Vapor Pressure: >760 Torrs (Normal Atmospheric Pressure)

Water Solubility (%): At 68°F (20°C), 1 gram of  $H_2S$  dissolves in 242 ml of water.

Molecular Weight: 34 Grams/Mole

Appearance and Odor: A colorless gas; odor of rotten eggs. Warning: Paralysis of olfactory sense occurs at 200 ppm.

## SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

Not Applicable

500°F (260°C)

% by Volume

4.3

46

Extinguishing Media: Hydrogen sulfide gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the gas; use a water spray to protect personnel attempting this. Unusual Fire or Explosion Hazards; Danger: Fire-exposed cylinders containing hydrogen sulfide gas can rupture violently. If it is safe to do so, remove them from the fire area or try to cool them with a direct water spray. This gas is denser than air and can travel a considerable distance to a low-lying source of ignition and flash back. It is flammable or explosive over a wide range of gas/air mixtures (see LEL and UEL). Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Fire fighters must use the maximum personal protective equipment available. Fight fires from explosion-proof or unmanned locations.

## SECTION 5. REACTIVITY DATA

Hydrogen sulfide is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material is very reactive; hazardous reactions occur between it and strong oxidizing agents, nitric acid, soda lime, sodium, sodium peroxide, acetaldehyde, copper, and others (see Genium ref. 84, p. 491M-107).

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas because of the extreme flammability of hydrogen sulfide.

Hazardous Products of Decomposition: During fires hydrogen sulfide may produce toxic gases such as sulfur oxides ( $SO_x$ ).



# Genium Publishing Corporation

1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 440  
Methane

Issued: 7/80

Revision: A, 8/89

## Section 1. Material Identification

29

**Methane Description:** Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.

**Other Designations:** Fire damp; marsh gas; methyl hydride; CH<sub>4</sub>; CAS No. 0074-82-8.

**Manufacturer:** Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R 1  
I -  
S -  
K 4



NFPA

HMIS

H 1

F 4

R 0

PPG\*

\* Sec. 8

## Section 2. Ingredients and Occupational Exposure Limits

Methane, ca 100%\*

OSHA PEL  
None established

ACGIH TLV, 1988-89  
None established

NIOSH REL  
None established

Toxicity Data†  
Not listed

\* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C<sub>2</sub>H<sub>6</sub>), propane (C<sub>3</sub>H<sub>8</sub>), butane (C<sub>4</sub>H<sub>10</sub>), higher molecular weight alkanes, carbon dioxide (CO<sub>2</sub>), nitrogen (N<sub>2</sub>), and oxygen (O<sub>2</sub>).

† Monitor NIOSH, RTECS (PA1490000), for future toxicity data.

## Section 3. Physical Data

Boiling Point: -259 °F (161.6 °C)

Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)

Molecular Weight: 16 g/mol

Water Solubility: Slight\*

Melting Point: -296.5 °F (-182.5 °C)

**Appearance and Odor:** A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

\*Soluble in alcohol and ether.

## Section 4. Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)

Autoignition Temperature: 999 °F (537 °C)

LEL: 5% v/v\*

UEL: 15% v/v\*

**Extinguishing Media:** Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. Treat any fire situation involving rapidly escaping and burning methane gas as an emergency. Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.

**Unusual Fire or Explosion Hazards:** Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.

**Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

\* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). Warning: Air with more than 14% by volume methane burns noiselessly. Methane burns with a pale, faintly luminous, not always easily detected flame.

## Section 5. Reactivity Data

**Stability/Polymerization:** Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.

**Conditions to Avoid:** Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating elements, or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.

**Hazardous Products of Decomposition:** Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

# Material Safety Data Sheet

Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 317  
TOLUENE  
(Revision D)

Issued: August 1979  
Revised: April 1986

## SECTION 1. MATERIAL IDENTIFICATION

20

**MATERIAL NAME:** TOLUENE

**OTHER DESIGNATIONS:** Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C<sub>7</sub>H<sub>8</sub>, CAS #0108-88-3

**MANUFACTURER/SUPPLIER:** Available from many suppliers, including:  
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400  
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,  
Columbus, OH; Telephone: (614) 889-3844

HMIS

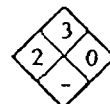
H: 2

F: 3

R: 0

PPE\*

\*See sect. 8



R 1

I 3

S 2

K 4

## SECTION 2. INGREDIENTS AND HAZARDS

%

## HAZARD DATA

Toluene



- Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.
- Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.
- Affects the mind.

ca 100

8-hr TLV: 100 ppm, or  
375 mg/m<sup>3</sup>\* (Skin)\*\*

Man, Inhalation, TClO:  
100 ppm: Psychotropic\*\*\*

Rat, Oral, LD<sub>50</sub>: 5000 mg/kg

Rat, Inhalation, LCLo:  
4000 ppm/4 hrs.

Rabbit, Skin, LD<sub>50</sub>: 14 gm/kg

Human, Eye: 300 ppm

## SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)

Vapor Pressure @ 20°C, mm Hg ... 22

Water Solubility @ 20°C, wt. % ... 0.05

Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24

Specific Gravity (H<sub>2</sub>O = 1) ... 0.866

Melting Point ... -139°F (-95°C)

Percent Volatile by Volume ... ca 100

Molecular Weight ... 92.15

**Appearance and odor:** Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

## SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits In Air

40°F (4°C) CC

896°F (480°C)

% by Volume

1.27

7.1

**EXTINGUISHING MEDIA:** Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

**UNUSUAL FIRE/EXPLOSION HAZARDS:** This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

## SECTION 5. REACTIVITY DATA

**CHEMICAL INCOMPATIBILITIES:** Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetroxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

**CONDITIONS TO AVOID:** Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

# Material Safety Data Sheet

From Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 382

VINYL CHLORIDE  
(Revision A)  
Issued: August 1978  
Revised: August 1988

## SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: VINYL CHLORIDE

Description (Origin/Uses): Widely used to make PVC resins and plastics; also used in organic synthesis.

Other Designations: VCM; Vinyl Chloride Monomer; Chloroethylene; Chloroethene;  $C_2H_3Cl$ ; CAS No. 0075-01-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS

H 2

F 4

R 1

PPG\*

\*See sect. 8

NFPA

R 1

I 4

S 3

K 4

## SECTION 2. INGREDIENTS AND HAZARDS

%

## EXPOSURE LIMITS

Vinyl Chloride, CAS No. 0075-01-4

Ca 100

OSHA PEL  
8-Hr TWA: 1 ppm\*

ACGIH TLV, 1987-88  
TLV-TWA: 5 ppm, 10 mg/m<sup>3</sup>

Toxicity Data\*\*  
Rat, Oral, LD<sub>50</sub>: 500 mg/kg

\*The action level set by OSHA in 29 CFR 1910.1017 is 0.5 ppm. Exposures above this level are strictly regulated by extensive medical record keeping, reporting, surveillance, and other requirements. Consult 29 CFR 1910.1017 for details.

\*\*See NIOSH, RTECS (No. KU9625000), for additional data with references to mutagenic, reproductive, and tumorigenic effects.

## SECTION 3. PHYSICAL DATA

Boiling Point: 61°F (16°C)

Water Solubility (%): Insoluble

Molecular Weight: 107 Grams/Mole

Vapor Density (Air = 1): 2.2

Appearance and Odor: A colorless gas; mild, sweet odor at high concentrations.

## SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

-108.4°F (-78°C)

882°F (472°C)

% by Volume

3.6%

33%

Extinguishing Media: Vinyl chloride gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the flow of gas. Use a water spray to protect the personnel attempting this and to cool fire-exposed cylinders/containers of vinyl chloride.

Unusual Fire or Explosion Hazards: This heavier-than-air gas can flow along surfaces, reach distant sources of ignition, and flash back. Eliminate sources of ignition in the workplace, particularly in low-lying areas such as sumps, cellars, basement utility rooms, and underground piping systems.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

## SECTION 5. REACTIVITY DATA

Vinyl chloride is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It can undergo hazardous polymerization if it is heated or reacted with a polymerization catalyst, or if the concentration/activity of the added inhibitor becomes too low.

Chemical Incompatibilities: This material is incompatible with copper, aluminum, and other polymerization catalysts or free radical initiators like hydroquinone.

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas. Avoid prolonged exposure to air, especially in the presence of certain contaminants, because dangerous levels of polyperoxides may accumulate. Avoid exposure to sunlight; if the proper catalytic conditions occur, the vinyl chloride monomer may react with itself and undergo an explosive polymerization reaction. Violent ruptures of containers of this gas can occur.

Hazardous Products of Decomposition: During fires, vinyl chloride may decompose into toxic gases such as hydrogen chloride, carbon monoxide, and phosgene.

# Material Safety Data Sheet

From Genium's Reference Collection  
Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 318

XYLENE (Mixed Isomers)  
(Revision D)  
Issued: November 1980  
Revised: August 1988

## SECTION 1: MATERIAL IDENTIFICATION

26

**Material Name:** XYLENE (Mixed Isomers)

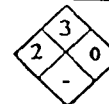
**Description (Origin/Uses):** Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

**Other Designations:** Dimethylbenzene; Xylol;  $C_6H_{10}$ ; CAS No. 1330-20-7

**Manufacturers:** Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek*

**Buyers' Guide** (Genium ref. 73) for a list of suppliers.

**Comments:** Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.



NFPA

HMIS

H 2 R 1

F 3 I 3

R 0 S 2

PPG\* K 3

\*See sect. 8

## SECTION 2: INGREDIENTS AND HAZARDS

%

## EXPOSURE LIMITS

Xylene (Mixed Isomers), CAS No. 1330-20-7\*

\*\*

IDLH\*\*\* Level: 1000 ppm

\*o-Xylene, CAS No. 0095-47-6

m-Xylene, CAS No. 0108-38-3

p-Xylene, CAS No. 0106-42-3

\*\*\*Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

\*\*\*Immediately dangerous to life and health.

\*\*\*\* See NIOSH, RTECS (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

OSHA PEL

8-Hr TWA: 100 ppm, 435 mg/m<sup>3</sup>

ACGIH TLVs, 1987-88

TLV-TWA: 100 ppm, 435 mg/m<sup>3</sup>

TLV-STEL: 150 ppm, 655 mg/m<sup>3</sup>

Toxicity Data\*\*\*\*

Human, Inhalation, TC<sub>50</sub>: 200 ppm

Man, Inhalation, LC<sub>50</sub>: 10000 ppm/6 Hrs

Rat, Oral, LD<sub>50</sub>: 4300 mg/kg

## SECTION 3: PHYSICAL DATA

**Boiling Point:** 275°F to 293°F (135°C to 145°C)\*

**Melting Point:** -13°F (-25°C)

**Evaporation Rate:** 0.6 Relative to BuAc = 1

**Specific Gravity (H<sub>2</sub>O = 1):** 0.86

**Water Solubility (%):** Insoluble

**Molecular Weight:** 106 Grams/Mole

**% Volatile by Volume:** Ca 100

**Vapor Pressure:** 7 to 9 Torr at 68°F (20°C)

**Vapor Density (Air = 1):** 3.7

**Appearance and Odor:** A clear liquid; aromatic hydrocarbon odor.

\*Materials with wider and narrower boiling ranges are commercially available.

## SECTION 4: FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

81°F to 90°F (27°C to 32°C)

867°F (464°C)

% by Volume

1%

7%

**Extinguishing Media:** Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

**Unusual Fire or Explosion Hazards:** Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

**Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

## SECTION 5: REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

**Chemical Incompatibilities:** This material may react dangerously with strong oxidizers.

**Conditions to Avoid:** Avoid any exposure to sources of ignition and to strong oxidizers.

**Hazardous Products of Decomposition:** Carbon monoxide (CO) may be evolved during xylene fires.

SUDDEN RELEASE HAZARD: N

BAC14020 Page 010 of 01

SECTION 16

OTHER

COPYRIGHT 1994 OCCUPATIONAL HEALTH SERVICES, INC. ALL RIGHTS RESERVED.

-ADDITIONAL INFORMATION-

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THIS INFORMATION IS PROVIDED WITHOUT ANY WARRANTY EXPRESSED OR IMPLIED, REGARDING ITS CORRECTNESS. THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR KNOWLEDGE. WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR THE CONDITIONS OR METHODS.



chronic pneumonitis and mild anemia. Repeated exposure to mercury and its compounds may result in sensitization. Women occupationally exposed have reported menstrual disturbances, reduced ovulation and an increased risk of spontaneous abortion. Intrauterine exposure may result in tremors and involuntary movements in the infants. Mercury is excreted in breast milk. Reproductive effects have been reported in animals.

#### SKIN CONTACT:

##### MERCURY:

##### SENSITIZER/NEUROTOXIN/NEPHROTOXIN.

**ACUTE EXPOSURE-** Direct contact with liquid may cause irritation and redness. Small amounts of mercury may be absorbed through intact skin. Allergic reactions that may occur in previously exposed persons include dermatitis, encephalitis, and death. Subcutaneous introduction, from handling broken thermometers, may result in local inflammation, granulomatous skin reactions, and slight signs of mercury poisoning including digestive disorders, metallic taste in the mouth, and neuropsychic disorders.

**CHRONIC EXPOSURE-** Prolonged or repeated exposure may result in dermal sensitization and systemic effects as detailed in chronic inhalation exposure.

#### EYE CONTACT:

##### MERCURY:

**ACUTE EXPOSURE-** Direct contact with liquid may cause irritation and redness. Animal studies indicate diffusion and absorption of mercury into the tissues of the eye may occur. No clinical signs of conjunctivitis or inflammation occurred.

**CHRONIC EXPOSURE-** Mercury exposure from inhalation, ingestion, or skin contact may be indicated by mercurialentis, discoloration of the crystalline lens, on slit lamp examination of the eye.

#### INGESTION:

##### MERCURY:

##### NEUROTOXIN/NEPHROTOXIN.

**ACUTE EXPOSURE-** May cause burning of the mouth and throat, thirst, nausea and vomiting. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute toxic response. Rarely, a large single dose may result in signs and symptoms of chronic inhalation if sufficient amounts of mercury are retained in the body.

**CHRONIC EXPOSURE-** Repeated ingestion of small amounts of mercury may result in the absorption of sufficient amounts to produce toxic effects as detailed in chronic inhalation exposure.

#### | SECTION 12

#### ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT RATING (0-4): no data available

ACUTE AQUATIC TOXICITY: no data available

DEGRADABILITY: no data available

LOG BIOCONCENTRATION FACTOR (BCF): no data available

LOG OCTANOL/WATER PARTITION COEFFICIENT: no data available

MELTING POINT: -38 F (-39 C)  
VAPOR PRESSURE: 0.002 mmHg @ 25 C  
VAPOR DENSITY: 7.0  
SPECIFIC GRAVITY: 13.5939  
WATER SOLUBILITY: insoluble  
SOLVENT SOLUBILITY: Soluble in boiling sulfuric acid, nitric acid, lipids;  
insoluble in alcohol, ether, hydrochloric acid, hydrogen bromide,  
hydrogen iodide.

VISCOSITY: 1.55 cP @ 20 C

-----  
SECTION 10 STABILITY AND REACTIVITY

REACTIVITY:

Stable under normal temperatures and pressures.

CONDITIONS TO AVOID:

May burn but does not ignite readily. Flammable, poisonous gases may accumulate in tanks and hopper cars. May ignite combustibles (wood, paper, oil, etc.).

INCOMPATIBILITIES:

MERCURY:

ACETYLENE: Formation of explosive compound.  
ACETYLINIC COMPOUNDS: Formation of explosive compound.  
ALUMINUM: Corrodes.  
AMINES: May form explosive compounds.  
AMMONIA + MOISTURE: Forms explosive compound.  
BORON DIODPHOSPHIDE: Ignites in contact with mercury vapors.  
BROMINE: Violent reaction.  
3-BROMOPROPYNE: Explosion hazard.  
CALCIUM: Amalgam formation @ 390 C is violent.  
CHLORINE: Ignites @ 200-300 C.  
CHLORINE DIOXIDE: Explodes.  
COPPER (AND ALLOYS): May be attacked.  
ETHYLENE OXIDE + TRACES OF ACETYLENE: May form explosive acetylides.  
LITHIUM: Amalgam formation is violently exothermic and may be explosive.  
METHYL AZIDE: Produces shock sensitive mixture.  
METHYLSILANE + OXYGEN: Produces shock sensitive mixture.  
NITRIC ACID + ALCOHOLS: Forms fulminates capable of detonation.  
OXALIC ACID: Forms shock sensitive compound.  
OXIDANTS: Violent reaction.  
PEROXYFORMIC ACID: Explosive reaction.  
POTASSIUM: Amalgam formation is vigorously exothermic and may be explosive.  
RUBIDIUM: Violent exothermic reaction.  
SILVER PERCHLORATE + 3-HEXYNE: Explodes.  
SILVER PERCHLORATE + 2-PENTYNE: Explodes.  
SODIUM: Amalgam formation is violently exothermic.  
SODIUM CARBIDE: Vigorous reaction.  
SULFURIC ACID (HOT): Reacts.  
TETRACARBONYLNICKEL + OXYGEN: Produces shock sensitive mixture.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products may include highly toxic vapors of mercury and mercury oxides.

---

SECTION 7 HANDLING AND STORAGE

---

Observe all federal, state and local regulations when storing this substance.

Store away from incompatible substances.

---

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

---

EXPOSURE LIMITS:

MERCURY, ALL FORMS EXCEPT ALKYL (AS HG):

- 0.05 mg/m3 OSHA TWA (vapor) (skin); 0.1 mg/m3 OSHA ceiling (skin)
- 0.05 mg/m3 ACGIH TWA (vapor); 0.10 mg/m3 ACGIH TWA (aryl & inorganic) (skin)  
(Notice of Intended Changes 1993-94)
- 0.05 mg/m3 NIOSH recommended TWA (vapor) (skin);
- 0.1 mg/m3 NIOSH recommended ceiling (skin)
- 0.01 ppm (0.1 mg/m3) DFG MAK TWA;
- 0.1 ppm (1.0 mg/m3) DFG MAK 30 minute peak, average value, 1 time/shift

MEASUREMENT METHOD: Hydrar(R) sorbent tube; acid; atomic absorption spectrometry (cold); (NIOSH Vol. III # 6009).

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting  
Subject to California Proposition 65 cancer and/or reproductive toxicity  
warning and release requirements- (July 1, 1990)

MERCURY:

1 pound CERCLA Section 103 Reportable Quantity

\*\*OSHA revoked the final rule limits of January 19, 1989 in response to the 11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective June 30, 1993. See 29 CFR 1910.1000 (58 FR 35338)\*\*

VENTILATION:

Provide local exhaust ventilation system to meet published exposure limits.

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance.

Emergency wash facilities:

Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

GLOVES:

Employee must wear appropriate protective gloves to prevent contact with this substance.

RESPIRATOR:

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of

## EYE CONTACT:

SHORT TERM EFFECTS: May cause irritation.

LONG TERM EFFECTS: No information available on significant adverse effects.

## INGESTION:

SHORT TERM EFFECTS: May cause thirst, nausea, vomiting, kidney damage and nerve damage.

LONG TERM EFFECTS: No information available on significant adverse effects.

## CARCINOGEN STATUS:

OSHA: N

NTP: N

IARC: N

## SECTION 4

## FIRST AID MEASURES

## INHALATION:

FIRST AID- Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Maintain airway and blood pressure and administer oxygen if available. Keep affected person warm and at rest. Treat symptomatically and supportively. Administration of oxygen should be performed by qualified personnel. Get medical attention immediately.

## SKIN CONTACT:

FIRST AID- Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

## EYE CONTACT:

FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

## INGESTION:

FIRST AID- Remove by gastric lavage or emesis. Maintain blood pressure and airway. Give oxygen if respiration is depressed. Do not perform gastric lavage or emesis if victim is unconscious. Get medical attention immediately (Dreisbach, Handbook of Poisoning, 12th Ed.). Administration of gastric lavage or oxygen should be performed by qualified medical personnel.

## NOTE TO PHYSICIAN

## ANTIDOTE:

The following antidote has been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

## MERCURY POISONING:

Give dimercaprol, 3 mg/kg (or 0.3 mL/10 kg) every 4 hours for the first 2 days and then 2 mg/kg every 12 hours for a total of 10 days if necessary. Dimercaprol is available as a 10% solution in oil for intramuscular administration. Hemodialysis will speed the removal of the mercury-dimercaprol complex. Penicillamine is also effective. Give up to 100 mg/kg/day (maximum 1 gr/day) divided into 4 doses for no longer than 1 week. If a longer administration period is warranted, dosage should not exceed 40 mg/kg/day.

-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: ACETONE

FORMULA: (CH<sub>3</sub>)<sub>2</sub>CO

FORMULA WT: 58.08

CAS NO.: 67-64-1

NIOSH/RTECS NO.: AL3150000

COMMON SYNONYMS: DIMETHYL KETONE; METHYL KETONE; 2-PROPANONE

PRODUCT CODES: 9010,9006,9002,9254,9009,9001,9004,5356,A134,9007,9005,9005  
9008

EFFECTIVE: 08/27/86

REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT

FLAMMABILITY - 3 SEVERE (FLAMMABLE)

REACTIVITY - 2 MODERATE

CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B  
EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

DANGER

CAUSES IRRITATION

EXTREMELY FLAMMABLE

HARMFUL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES,  
SKIN, CLOTHING.

MELTING POINT: -95 C ( -139 F)      VAPOR DENSITY(AIR=1): 2.0

SPECIFIC GRAVITY: 0.79      EVAPORATION RATE: ~10  
(H2O=1)      (BUTYL ACETATE=1)

SOLUBILITY(H2O):      COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY  
VOLUME: 100

APPEARANCE & ODOR:      CLEAR, COLORLESS LIQUID WITH A FRAGRANT  
SWEET ODOR.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP: -18 C ( 0 F)      NFPA 704M RATING: 1-3-0

FLAMMABLE LIMITS: UPPER - 13.0 %      LOWER - 2.6 %

FIRE EXTINGUISHING MEDIA

USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.  
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-  
CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE  
PRESSURE MODE.

MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.  
USE WATER  
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND  
FLASH BACK.

INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS,  
GASTROINTESTINAL IRRITATION.

CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR  
LIVER DAMAGE.

TARGET ORGANS

RESPIRATORY SYSTEM, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL  
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER  
FOR AT

LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

-----  
6 - REACTIVITY DATA  
-----

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: HEAT, FLAME, SOURCES OF IGNITION

INCOMPATIBLES: HALOGEN ACIDS AND HALOGEN COMPOUNDS, STRONG  
BASES,

STRONG OXIDIZING AGENTS, CAUSTICS, AMINES AND AMMONIA,  
CHLORINE AND CHLORINE COMPOUNDS,  
STRONG ACIDS, ESP. SULFURIC, NITRIC, HYDROCHLORIC

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET

TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE

CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 5000 PPM, A GAS MASK WITH ORGANIC VAPOR CANNISTER IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS WITH FULL FACE SHIELD IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, BUTYL RUBBER

GLOVES ARE RECOMMENDED.

-----  
9 - STORAGE AND HANDLING PRECAUTIONS  
-----

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER

TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID

STORAGE AREA.

-----  
10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION  
-----

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME ACETONE

HAZARD CLASS FLAMMABLE LIQUID

UN/NA UN1090





-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: ALUMINUM  
FORMULA: AL  
FORMULA WT: 26.98  
CAS NO.: 07429-90-5  
NIOSH/RTECS NO.: BD0330000  
PRODUCT CODES: 0446  
EFFECTIVE: 10/01/85  
REVISION #01

PRECAUTIONARY LABELLING  
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT  
FLAMMABILITY - 4 EXTREME (FLAMMABLE)  
REACTIVITY - 2 MODERATE  
CONTACT - 1 SLIGHT  
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING

DUST MAY FORM FLAMMABLE AND EXPLOSIVE MIXTURE WITH AIR,  
ESPECIALLY

WHEN DAMP.

KEEP AWAY FROM HEAT, SPARKS, FLAME.

AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH  
ADEQUATE

VENTILATION. IN CASE OF FIRE, SOAK WITH WATER. IN CASE OF SPILL,  
SWEEP UP AND

(H<sub>2</sub>O=1)

(BUTYL ACETATE=1)

SOLUBILITY(H<sub>2</sub>O):        NEGLIGIBLE (LESS THAN 0.1 %)    % VOLATILES BY  
VOLUME: N/A

APPEARANCE & ODOR: SILVERY-WHITE, ODORLESS METAL POWDER.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP: N/A

NFPA 704M RATING: 0-1-1

FLAMMABLE LIMITS: UPPER - N/A %    LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE DRY CHEMICAL OR CARBON DIOXIDE. DO NOT USE WATER.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-  
CONTAINED

(POSITIVE PRESSURE IF AVAILABLE) BREATHING APPARATUS WITH FULL  
FACEPIECE.

MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT  
RISK.

USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.  
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

-----  
5 - HEALTH HAZARD DATA  
-----

STRONG BASES, COMBUSTIBLE MATERIALS, WATER  
-----

7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA.

DO NOT TOUCH SPILLED MATERIAL.

DO NOT PUT ANY WATER ON LEAK OR SPILLS.

DO NOT GET WATER INSIDE CONTAINER.

WITH CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER.

MOVE CONTAINER(S) FROM SPILL AREA.

FLUSH AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL

ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

8 - PROTECTIVE EQUIPMENT  
-----

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET

TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION

CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, A DUST/MIST RESPIRATOR IS RECOMMENDED.

IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

-----  
MSDS for ALUMINUM

Page 4  
-----

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME           ALUMINUM, POWDER UNCOATED, (NON-PYROPHORIC)

HAZARD CLASS           4.3

UN/NA           UN1396

LABELS           DANGEROUS WHEN WET



-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: AMMONIA SOLUTION

FORMULA: NH<sub>3</sub> IN H<sub>2</sub>O

FORMULA WT: 17.03

CAS NO.: 1336-21-6

NIOSH/RTECS NO.: BQ9625000

COMMON SYNONYMS: AMMONIUM HYDROXIDE; AQUA AMMONIA

PRODUCT CODES: 9726,9724

EFFECTIVE: 09/03/86

REVISION #03

PRECAUTIONARY LABELLING  
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)

FLAMMABILITY - 1 SLIGHT

REACTIVITY - 2 MODERATE

CONTACT - 3 SEVERE (CORROSIVE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER

CAUSES BURNS

MAY BE FATAL IF SWALLOWED

VAPOR EXTREMELY IRRITATING

EXCEPTIONAL HEALTH AND CONTACT HAZARDS - READ MATERIAL SAFETY  
DATA SHEET

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

MELTING POINT: -78 C ( -108 F) VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 0.90  
(H2O=1)

EVAPORATION RATE: N/A  
(BUTYL ACETATE=1)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY  
VOLUME: 100

APPEARANCE & ODOR: CLEAR COLORLESS SOLUTION WITH A STRONG ODOR.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP: N/A

NFPA 704M RATING: 3-1-0

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-  
CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE  
PRESSURE MODE.

MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT  
RISK.

USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL; DO NOT GET  
WATER INSIDE  
CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS

GIVES OFF FLAMMABLE VAPORS. VAPORS MAY FORM EXPLOSIVE MIXTURE  
WITH AIR.

CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE.



BLINDNESS MAY OCCUR.  
INGESTION MAY CAUSE SEVERE BURNING OF MOUTH AND STOMACH.  
INGESTION IS HARMFUL AND MAY BE FATAL.

TARGET ORGANS  
RESPIRATORY SYSTEM, EYES

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE  
NONE IDENTIFIED

ROUTES OF ENTRY  
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE LARGE AMOUNTS OF

WATER. FOLLOW WITH DILUTED VINEGAR, FRUIT JUICE OR WHITES OF EGGS, BEATEN WITH WATER.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR

AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

WASH CLOTHING BEFORE RE-USE.

-----  
6 - REACTIVITY DATA  
-----

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: HEAT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET

TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE

CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 25 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH AMMONIA/AMINE CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

-----  
9 - STORAGE AND HANDLING PRECAUTIONS  
-----

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. STORE BELOW 25 C.

-----  
10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION  
-----

DOMESTIC (D.O.T.)

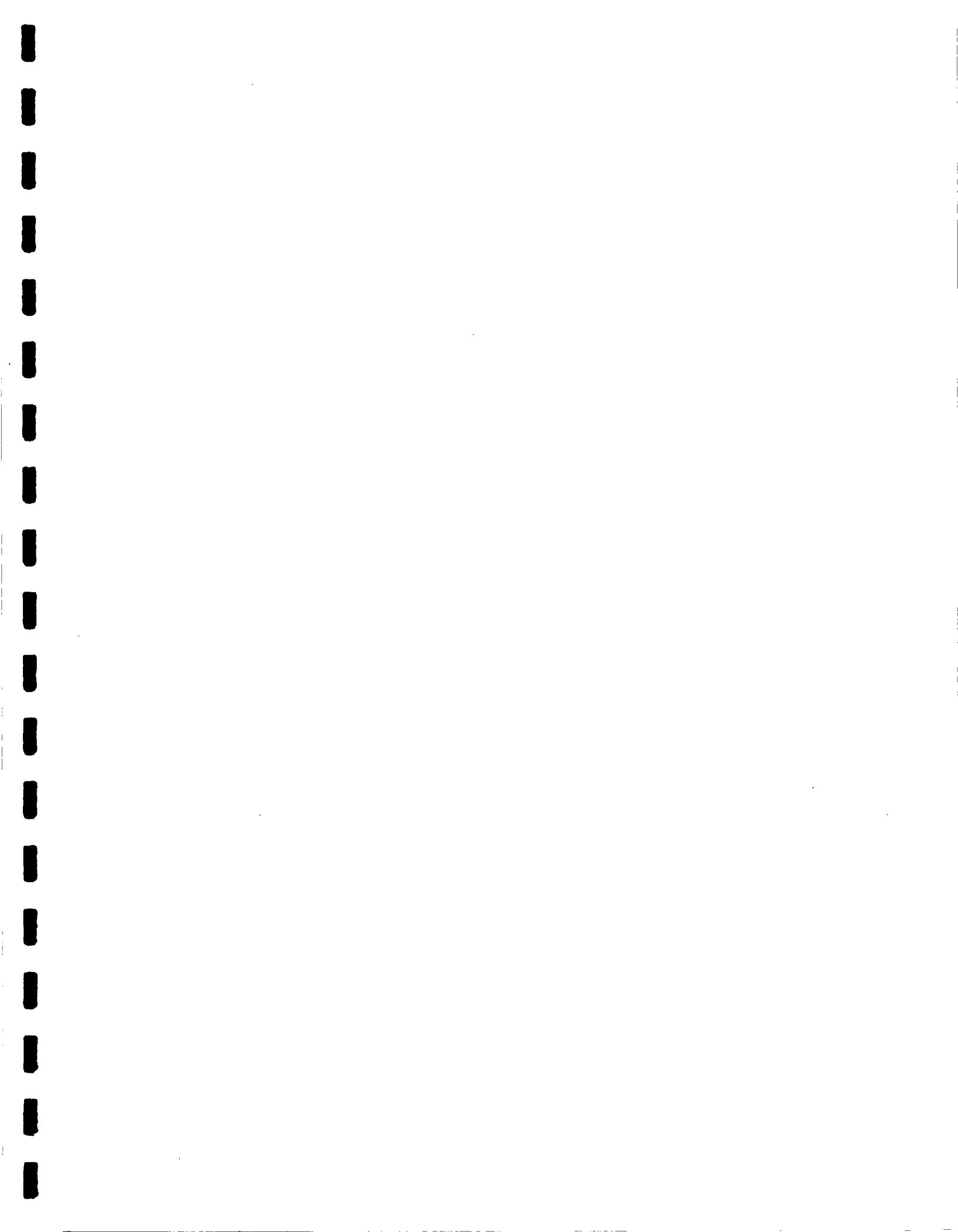
PROPER SHIPPING NAME AMMONIUM HYDROXIDE (12-44% AMMONIA)

HAZARD CLASS CORROSIVE MATERIAL (LIQUID)

UN/NA NA2672

LABELS CORROSIVE

REPORTABLE QUANTITY 100 LBS.



-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: ANTIMONY  
FORMULA: SB  
FORMULA WT: 121.75  
CAS NO.: 07440-36-0  
NIOSH/RTECS NO.: CC4025000  
COMMON SYNONYMS: STIBIUM, C.I. 77050  
PRODUCT CODES: 0848  
EFFECTIVE: 08/27/86  
REVISION #03

PRECAUTIONARY LABELLING  
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)  
FLAMMABILITY - 1 SLIGHT  
REACTIVITY - 2 MODERATE  
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER  
MAY BE FATAL IF INHALED  
CAUSES IRRITATION

AVOID CONTACT WITH EYES, SKIN, CLOTHING.  
DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH  
ADEQUATE  
VENTILATION. WASH THOROUGHLY AFTER HANDLING.

(H2O=1)

(BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY  
VOLUME: 0

APPEARANCE & ODOR: SILVER-WHITE, HARD, BRITTLE METAL.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

UNUSUAL FIRE & EXPLOSION HAZARDS

CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

-----  
5 - HEALTH HAZARD DATA  
-----

THRESHOLD LIMIT VALUE (TLV/TWA): 0.5 MG/M3 ( PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.5 MG/M3 ( PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION MAY BE HARMFUL OR FATAL.

PROLONGED EXPOSURE MAY CAUSE DERMATITIS.

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: HEAT, LIGHT

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG ACIDS, HALOGEN  
ACIDS,  
CHLORINE, FLUORINE

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE  
CLOTHING.

WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY  
CONTAINER AND  
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

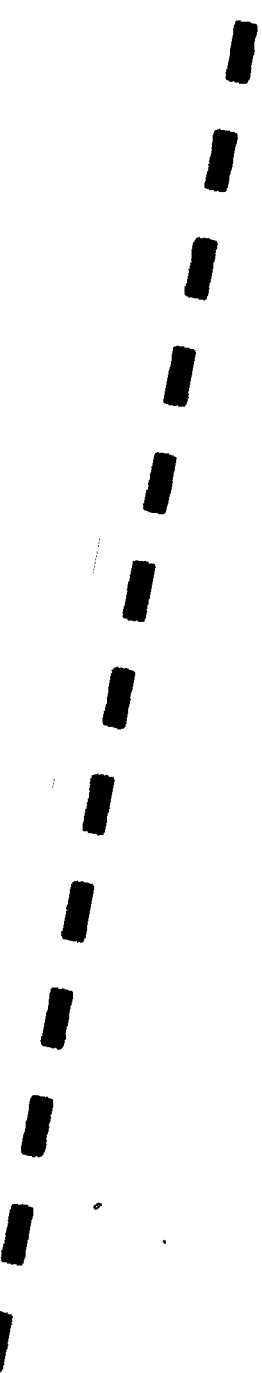
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND  
LOCAL  
ENVIRONMENTAL REGULATIONS.

-----  
8 - PROTECTIVE EQUIPMENT  
-----

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO  
MEET  
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF  
AIRBORNE

CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP  
TO 1 PPM, A DUST/MIST RESPIRATOR IS  
RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED



Common Name: Arsenic  
CAS Number: 7440-38-2  
DOT Number: UN 1558  
Date: November, 1986  
-----

#### HAZARD SUMMARY

- \* Arsenic can affect you when breathed in and may enter through the skin.
- \* Arsenic is a CARCINOGEN//HANDLE WITH EXTREME CAUTION.
- \* It may damage the developing fetus.
- \* Skin contact can cause burning, itching, thickening and color changes.
- \* High or repeated exposure can damage nerves, with "pins and needles," numbness, and weakness of arms and legs as well as poor appetite, nausea, stomach cramps, nose ulcers, hoarseness, or damage to the liver, blood vessels, or red blood cells.
- \* Arsenic near acid or acid mist can release a VERY DEADLY gas, Arsine.

#### IDENTIFICATION

Arsenic is a silver-gray brittle, crystalline solid. It also exists in black and yellow amorphous forms. It is used as an alloying agent for heavy metals, in special solders and in medicine.

#### REASON FOR CITATION

- \* Arsenic is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, IARC, DOT and other authorities.
- \* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.

#### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- \* If you think you are experiencing any work-related health



immediately or shortly after exposure to Arsenic:

- \* Skin contact can cause burning, itching and a rash.
- \* Breathing Arsenic, such as in liquid spray or powder form, can cause nose and throat irritation.
- \* Eye contact can cause red, watery eyes and irritation.
- \* High exposures can cause poor appetite, nausea, vomiting and muscle cramps.
- \* Heart effects with an abnormal EKG can also occur with very high exposures.

#### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Arsenic and can last for months or years:

#### Cancer Hazard

- \* Arsenic is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
- \* Many scientists believe there is no safe level of exposure to a CARCINOGEN. Such substances may also have the potential for causing reproductive damage in humans.

#### Reproductive Hazard

- \* Arsenic may damage the developing fetus.
- \* Arsenic should be handled as a potential teratogenic agent since some Arsenic compounds are known teratogens.

#### Other Long-Term Effects

- \* Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose. Hoarseness and sore eyes also occur.
- \* High or repeated exposure can cause nerve damage, with "pins and needles," burning, numbness, and later weakness of arms and legs.
- \* Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.
- \* Repeated exposure can also damage the liver, cause narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

#### MEDICAL

and/or provide local exhaust ventilation at the site of calc al release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- \* Where possible, automatically transfer Arsenic from drums or other storage containers to process containers.
- \* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: Inorganic Arsenic # 75-149.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by Arsenic should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Arsenic.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* Wash any areas of the body that may have contacted Arsenic at the end of each workday, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where Arsenic is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- \* Use a vacuum or a wet method to reduce dust during clean-up. Do not dry sweep.
- \* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

CN 368, Trenton, NJ 08625-0368  
(609) 984-2202

-----  
-----

## ECOLOGICAL INFORMATION

Arsenic is a naturally occurring element which is used to make glass, cloth, and electrical semiconductors. It is also commonly used in fungicides, wood preservatives, growth stimulants for plants and animals, and in veterinary uses. Arsenic enters the environment mainly from its use as a pesticide and from emissions from coal-fueled power plants.

### ACUTE (SHORT-TERM) ECOLOGICAL EFFECTS

Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen two to four days after animals or plants come in contact with a toxic chemical substance.

Arsenic metabolism and effects are significantly influenced by the animal/plant tested, the route of administration, the physical and chemical form of the arsenical, and the dose. Inorganic arsenic compounds are more toxic than organic arsenic compounds.

Arsenic has high acute toxicity to aquatic life, birds, and land animals. Except where soil arsenic content is high (around smelters and where arsenic-based pesticides have been used heavily), arsenic does not accumulate in plants to toxic levels. Where soil arsenic content is high, growth and crop yields can be decreased.

### CHRONIC (LONG-TERM) ECOLOGICAL EFFECTS

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure(s) to a toxic chemical.

Arsenic has high chronic toxicity to aquatic life, and moderate



-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: CHROMIUM

FORMULA: CR

FORMULA WT: 52.00

CAS NO.: 7440-47-3

NIOSH/RTECS NO.: CB4200000

PRODUCT CODES: 4961

EFFECTIVE: 09/10/86

REVISION #03

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE

FLAMMABILITY - 0 NONE

REACTIVITY - 0 NONE

CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH  
THOROUGHLY AFTER  
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

-----  
2 - HAZARDOUS COMPONENTS  
-----

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.  
USE WATER

TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

-----  
5 - HEALTH HAZARD DATA  
-----

NOTE: WHILE THE SPECIFIC COMPOUNDS CANNOT BE IDENTIFIED, THERE IS EVIDENCE THAT CERTAIN CHROMIUM COMPOUNDS CAUSE CANCER IN HUMANS AND

EXPERIMENTAL ANIMALS. CHROMIUM IS WIDELY DISTRIBUTED IN AIR, WATER, SOIL

AND FOOD. TRIVALENT CHROMIUM MAY BE AN ESSENTIAL TRACE INGREDIENT IN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE  
NONE IDENTIFIED

ROUTES OF ENTRY  
INGESTION, INHALATION

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS,  
IMMEDIATELY GIVE

LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE  
EXPOSED

PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT  
LEAST 15

MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER  
FOR AT LEAST

15 MINUTES.

-----  
6 - REACTIVITY DATA  
-----

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: FLAME

INCOMPATIBLES: CARBONATES, STRONG BASES, MINERAL ACIDS

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL  
CHEMICAL STORAGE  
AREA.

-----  
10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION  
-----

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHROMIUM  
HAZARD CLASS ORM-E  
LABELS NONE  
REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)





-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: COPPER

FORMULA: CU

FORMULA WT: 63.55

CAS NO.: 07440-50-8

NIOSH/RTECS NO.: GL5325000

COMMON SYNONYMS: BRONZE POWDER; C.I. 77400; ARWOOD COPPER

PRODUCT CODES: 1732,1736,1720,1714,1728

EFFECTIVE: 06/25/86

REVISION #02

PRECAUTIONARY LABELLING  
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE

FLAMMABILITY - 0 NONE

REACTIVITY - 0 NONE

CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION

MAY CAUSE IRRITATION

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH  
THOROUGHLY AFTER

HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SOLUBILITY(H<sub>2</sub>O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY  
VOLUME: 0

APPEARANCE & ODOR: REDDISH, LUSTROUS, MALLEABLE METAL.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

TOXIC GASES PRODUCED

COPPER FUMES

-----  
5 - HEALTH HAZARD DATA  
-----

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M<sup>3</sup> ( PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

DUST MAY CAUSE SNEEZING AND COUGHING.

DUST MAY IRRITATE SKIN OR EYES.

PROLONGED EXPOSURE MAY CAUSE DERMATITIS.

INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS,  
GASTROINTESTINAL IRRITATION.

NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON  
INHALATION

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, ACTIVE HALOGEN COMPOUNDS,  
CHLORINE,  
FLUORINE, IODINE, BROMINE, AMMONIA

DECOMPOSITION PRODUCTS: COPPER FUMES

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND  
REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND  
LOCAL  
ENVIRONMENTAL REGULATIONS.

-----  
8 - PROTECTIVE EQUIPMENT  
-----

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO  
MEET

TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE  
VENTILATION

CONDITIONS EXIST. IF AIRBORNE CONCENTRATION  
EXCEEDS TLV, A DUST/MIST RESPIRATOR IS  
RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF  
RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS

-----  
MSDS for COPPER

Page 4  
-----

HAZARD CLASS        ORM-E

LABELS            NONE

REPORTABLE QUANTITY    5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME    CHEMICALS, N.O.S. (NON-REGULATED)



E I DUPONT -- 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)  
MATERIAL SAFETY DATA SHEET

FSC: 6850

Manufacturer's CAGE: 51851

Part No. Indicator: A

Part Number/Trade Name: 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)

---

---

General Information

---

---

Company's Name: E I DUPONT DE NEMOURS & CO  
Company's Street: 331 TREBLE COVE RD  
Company's City: NORTH BILLERICA  
Company's State: MA  
Company's Country: US  
Company's Zip Code: 01862  
Company's Emerg Ph #: 800-483-7616;800-424-9300(CHEMTREC)  
Company's Info Ph #: 508-667-9538;800-441-3637  
Safety Data Action Code: A  
Record No. For Safety Entry: 001  
Tot Safety Entries This Stk#: 001  
Status: SMJ  
Date MSDS Prepared: 01AUG90  
Safety Data Review Date: 28FEB95  
MSDS Serial Number: BWRVS

---

---

Ingredients/Identity Information

---

---

Proprietary: NO  
Ingredient: BENZENE, 1,2,4-TRIMETHYL-; (1,2,4-TRIMETHYLBENZENE) (SARA 313)  
Ingredient Sequence Number: 01  
Percent: 100  
Ingredient Action Code: A  
NIOSH (RTECS) Number: DC3325000  
CAS Number: 95-63-6  
OSHA PEL: 25 PPM  
ACGIH TLV: 25 PPM

---

EYE WASH FOUNTAIN & QUICK DRENCH SHOWER SHOULD BE (ING 7)

Ingredient Sequence Number: 06

Ingredient Action Code: A

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

-----  
Proprietary: NO

Ingredient: ING 6:W/TN THE IMMEDIATE WORK AREA.

Ingredient Sequence Number: 07

Ingredient Action Code: A

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

=====

---

---

Physical/Chemical Characteristics

---

---

=====

Appearance And Odor: COLORLESS LIQUID W/AROMATIC ODOR.

Boiling Point: 336F,169C

Melting Point: -47F,-44C

Vapor Pressure (MM Hg/70 F): 1.7 @ 20C

Percent Volatiles By Volume: 100

=====

---

---

Fire and Explosion Hazard Data

---

---

=====

Flash Point: 112F,44C

Flash Point Method: CC

Lower Explosive Limit: 0.9%

Upper Explosive Limit: 6.4%

Extinguishing Media: DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY  
OR

ALCOHOL FOAM.

Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL  
PROTECTIVE

EQUIPMENT (FP N).

Unusual Fire And Expl Hazrds: MOD FIRE HAZ WHEN EXPOSED TO HEAT/FLAME.



WT GAIN, PROGRESSIVELY INCR LYMPHOPENIA & NEUTROPHILIA & A MARKED CNS

DEPRESS OBSERVED IN ANIMALS. SKIN:MAY CAUSE DERMATITIS. EYE:MAY CAUSE

CONJUNCTIVITIS. INGEST:NO DATA AVAILABLE.

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: INHAL:REMOVE FROM EXPOS AREA TO FRESH AIR IMMED.

IF BRTHG HAS STOPPED, PERFORM ARTF RESP. KEEP PERS WARM & AT REST. TREAT

SYMPTOMATICALLY & SUPPORTIVELY. GET MED ATTN IMMED. SKIN:REMOVE CONTAM

CLTHG & SHOES IMMED. WASH AFFECTED AREA W/SOAP OR MILD DETERGENT & LG AMTS

OF WATER UNTIL NO EVID OF CHEM REMAINS (APPROX 15-20 MINS). GET MED ATTN

IMMED. EYES:WASH IMMED W/LG AMTS OF WATER/NORMAL (SUPDAT)

---

---

#### Precautions for Safe Handling and Use

---

---

Steps If Matl Released/Spill: SM SPILLS:SHUT OFF IGNIT SOURCES. STOP LEAK IF YOU CAN DO IT W/OUT RISK. USE WATER SPRAY TO REDUCE VAPS. TAKE UP W/SAND

OR OTHER ABSORB MATL & PLACE INTO CNTNRS FOR LATER DISP. NO SMOKING,

FLAMES/FLARES IN HAZ AREA. ISOLATE HAZ AREA & DENY ENTRY.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). DISPOSAL MUST BE I/A/W STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZ WASTE NUMBER D001.

Precautions-Handling/Storing: AVOID CONTACT W/HEAT, SPARKS, FLAMES OR OTHER SOURCES OF IGNITION. VAPORS MAY BE EXPLOSIVE & POISONOUS; DO NOT

ALLOW UNNECESSARY PERSONNEL IN AREA.

Other Precautions: DO NOT OVERHEAT CONTAINERS; CONTAINERS MAY VIOLENTLY

RUPTURE & TRAVEL A CONSIDERABLE DISTANCE IN HEAT OF FIRE. STORE I/A/W 29

Label Date: 28FEB95

Label Status: M

Common Name: 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)

Chronic Hazard: YES

Signal Word: WARNING!

Acute Health Hazard-Moderate: X

Contact Hazard-Slight: X

Fire Hazard-Moderate: X

Reactivity Hazard-None: X

Special Hazard Precautions: ACUTE:INHALATION, SKIN & EYE IRRITANT.

NARCOTIC. MODERATELY TOXIC BY INHALATION & INGESTION. INHAL:MAY CAUSE

SYSTEMIC TOXICITY DUE TO ABSORPTION IS NOT PROBABLE. EYE:MAY CAUSE

IRRITATION. INGEST:NO SYMPTOMS WERE FOUND.

CHRONIC:INHALATION:ASTHMATIC

BRONCHITIS, HEADACHE, FATIGUE, TENSION, ANXIETY, NERVOUSNESS AND DROWSINESS

OBSERVED IN EXPOSED WORKERS. DEPRESSED WEIGHT GAIN, PROGRESSIVELY

INCREASING LYMPHOPENIA AND NEUTROPHILIA AND A MARKED CENTRAL NERVOUS SYSTEM

DEPRESSION OBSERVED IN ANIMALS. SKIN:MAY CAUSE DERMATITIS.

EYES:MAY CAUSE

CONJUNCTIVITIS.

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: E I DUPONT DE NEMOURS & CO

Label Street: 331 TREBLE COVE RD

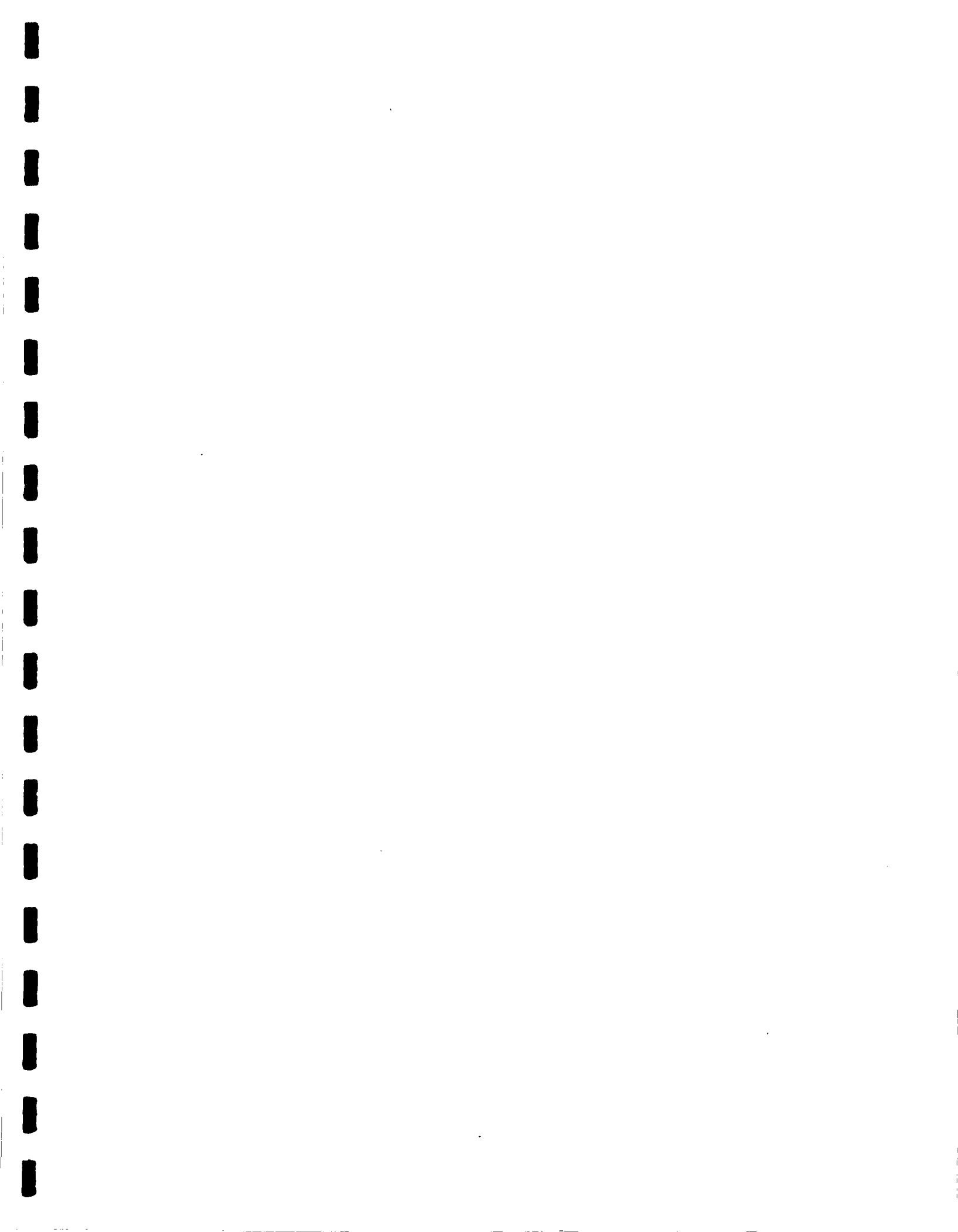
Label City: NORTH BILLERICA

Label State: MA

Label Zip Code: 01862

Label Country: US

Label Emergency Number: 800-483-7616;800-424-9300(CHEMTREC)



-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: LEAD, GRANULAR OR SHOT  
FORMULA: PB  
FORMULA WT: 207.19  
CAS NO.: 7439-92-1  
NIOSH/RTECS NO.: OF7525000  
COMMON SYNONYMS: C.I. 77575  
PRODUCT CODES: 4996,2256,2266  
EFFECTIVE: 11/25/86  
REVISION #02

PRECAUTIONARY LABELLING  
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE  
FLAMMABILITY - 0 NONE  
REACTIVITY - 0 NONE  
CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING  
MAY BE FATAL IF SWALLOWED  
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH  
THOROUGHLY AFTER  
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

-----  
(H2O=1)

(BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY  
VOLUME: 0

APPEARANCE & ODOR: GRAYISH-WHITE, SILVERY METAL, WITH NO ODOR.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-  
CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE  
PRESSURE MODE.

TOXIC GASES PRODUCED

LEAD FUMES

-----  
5 - HEALTH HAZARD DATA  
-----

THRESHOLD LIMIT VALUE (TLV/TWA): 0.15 MG/M3 ( PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.05 MG/M3 ( PPM)

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

IF INHALED IN LARGE AMOUNTS, MOVE EXPOSED PERSON TO FRESH AIR.

GET MEDICAL ATTENTION.

IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER  
FOR AT

LEAST 15 MINUTES. GET MEDICAL ATTENTION.

IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF SOAP  
AND WATER

FOR AT LEAST 15 MINUTES.

-----  
6 - REACTIVITY DATA  
-----

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

INCOMPATIBLES: STRONG OXIDIZING AGENTS, POTASSIUM METAL,  
SODIUM METAL

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE  
CLOTHING.

WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY  
CONTAINER AND

COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND  
LOCAL

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL  
CHEMICAL STORAGE  
AREA.

-----  
10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION  
-----

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME LEAD  
HAZARD CLASS ORM-E  
LABELS NONE  
REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)





MAYS CHEMICAL -- ZINC OXIDE  
MATERIAL SAFETY DATA SHEET  
FSC: 6810  
NIIN: 00D003155  
Manufacturer's CAGE: 6T060  
Part No. Indicator: A  
Part Number/Trade Name: ZINC OXIDE

---

---

General Information

---

---

Company's Name: MAYS CHEMICAL CO., INC.  
Company's Street: 7760 E. 89TH STREET  
Company's P. O. Box: 50927  
Company's City: INDIANAPOLIS  
Company's State: IN  
Company's Country: US  
Company's Zip Code: 46256  
Company's Emerg Ph #: 317-842-8722  
Company's Info Ph #: 317-842-8722  
Record No. For Safety Entry: 001  
Tot Safety Entries This Stk#: 001  
Status: SM  
Date MSDS Prepared: 06APR89  
Safety Data Review Date: 01FEB94  
Supply Item Manager: CX  
MSDS Serial Number: BSHQQ  
Hazard Characteristic Code: T6  
Report for NIIN: 00D003155

---

---

Ingredients/Identity Information

---

---

Proprietary: NO  
Ingredient: ZINC OXIDE  
Ingredient Sequence Number: 01  
NIOSH (RTECS) Number: ZH4810000  
CAS Number: 1314-13-2  
OSHA PEL: 15 MG/M3 TDUST

Stability: YES

Cond To Avoid (Stability): HIGH TEMPERATURES.

Materials To Avoid: CHLORINATED RUBBER; REACTS VIOLENTLY W/MAGNESIUM,

LINSEED OIL. W/ MAGNESIUM CAN REACT EXPLOSIVELY WHEN HEATED.

Hazardous Decomp Products: SUBLIMES TO PRODUCE TOXIC FUMES.

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): N/A.

---

---

#### Health Hazard Data

---

---

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: YES

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: ACUTE:SKIN/EYE:IRRITATION. INHAL:IRRI  
RESPIRATORY TRACT. NUISANCE DUST CAN CAUSE UNPLEASANT DEPOSITS  
IN NASAL

PASSAGES. HI CONC ZINC CHILLS MAY OCCUR. INGEST:EXCESSIVE ORAL  
DOSES MAY

CAUSE INTESTINAL OBSTRUCTION. CHRONIC:PER MFG'S MSDS NO  
INFORMATION FOUND.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

COUGHING, SHORTNESS OF BREATH, ZINC CHILL---WEAKNESS, FATIGUE,  
NAUSEA,

CHILLS. INGEST:NAUSEA, FEVER, STOMACH CRAMPS, INTESTINAL  
OBSTRUCTION.

Med Cond Aggravated By Exp: PRE-EXISTING HEART CONDITION OR IMPAIRED  
RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF  
THIS

MATERIAL.

Emergency/First Aid Proc: INHAL:REMOVE TO FRESH AIR. SEE DOCTOR FOR ANY  
BREATHING DIFFICULTY. INGEST:GIVE SEVERAL GLASSES OF WATER TO  
DILUTE. IF LG

AMTS OF MATERIAL WERE SWALLOWED, SEE DOCTOR. SKIN:WASH W/SOAP  
& WATER. SEE

DOCTOR IF IRRITATION DEVELOPS. EYE:WASH THOROUGHLY W/WATER. SEE  
DOCTOR IF

DOT PSN Code: ZZZ

DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF  
TRANSPORTATION

IMO PSN Code: ZZZ

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF  
TRANSPORTATION

IATA PSN Code: ZZZ

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF  
TRANSPORTATION

AFI PSN Code: ZZZ

AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION  
Report for NIIN: 00D003155

---

---

Disposal Data

---

---

---

---

Label Data

---

---

Label Required: YES

Technical Review Date: 01FEB94

Label Status: F

Common Name: ZINC OXIDE

Chronic Hazard: N/P

Signal Word: CAUTION!

Acute Health Hazard-Slight: X

Contact Hazard-Slight: X

Fire Hazard-None: X

Reactivity Hazard-None: X

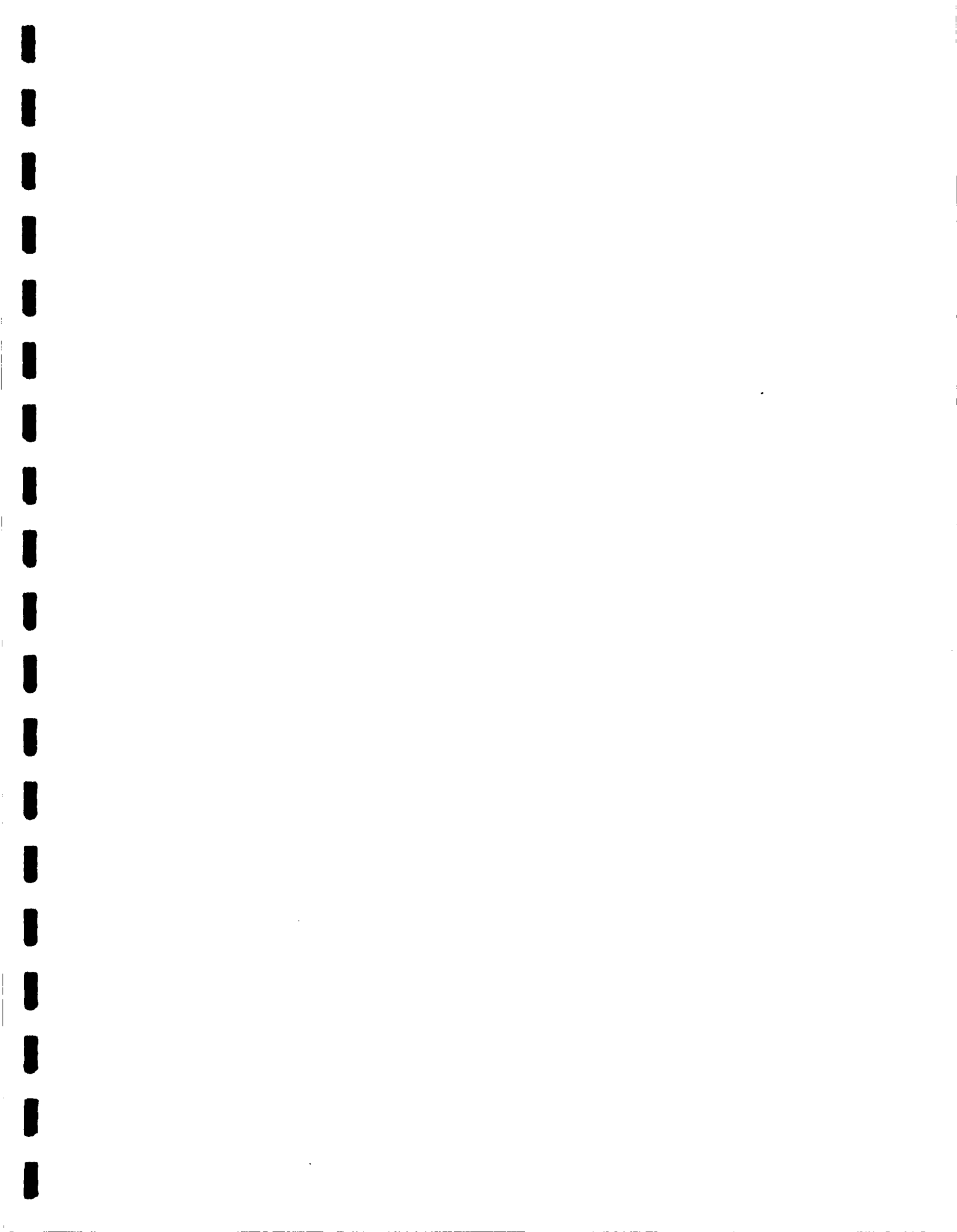
Special Hazard Precautions: SKIN/EYE:IRRIT. INHAL:IRRIT RESP TRACT.

NUISANCE DUST CAN CAUSE UNPLEASANT DEPOSITS IN NASAL PASSAGES.HI  
CONC ZINC

CHILLS MAY OCCUR. INGEST:EXCESS ORAL DOSES MAY CAUSE INTESTINAL  
OBSTRUCTION. CHRONIC:PER MFG'S MSDS NO INFOR FOUND. TARGET  
ORGANS:EYE/SKIN/

Report for NIIN: 00D003155

RESP SYS/INTESTINAL SYS. 1ST AID:INHAL:REMOVE TO FRESH AIR.SEE  
DOCTOR FOR



-----  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: NICKEL, SHOT

FORMULA: NI

FORMULA WT: 58.71

CAS NO.: 07440-02-0

NIOSH/RTECS NO.: QR5950000

PRODUCT CODES: 2748

EFFECTIVE: 09/03/86

REVISION #03

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (CANCER CAUSING)

FLAMMABILITY - 0 NONE

REACTIVITY - 0 NONE

CONTACT - 3 SEVERE (LIFE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

WARNING

HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN  
MAY CAUSE ALLERGIC REACTION.

EXCEPTIONAL CONTACT HAZARD - READ MATERIAL SAFETY DATA  
SHEET

NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS.  
EXERCISE DUE CARE.

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

-----  
SPECIFIC GRAVITY: 8.90  
(H2O=1)

EVAPORATION RATE: N/A  
(BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY  
VOLUME: 0

APPEARANCE & ODOR: GRAY, SPHERICAL PELLETS.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (OPEN CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-  
CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE  
PRESSURE MODE.

MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.  
USE WATER

TO KEEP FIRE-EXPOSED CONTAINERS COOL.

TOXIC GASES PRODUCED

NICKEL FUMES

-----  
5 - HEALTH HAZARD DATA  
-----

THIS SUBSTANCE IS LISTED AS NTP ANTICIPATED HUMAN CARCINOGEN, IARC  
PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B).

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR  
AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG ACIDS, AMMONIA, ALUMINUM,  
STRONG OXIDIZING AGENTS

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.

WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND  
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL  
ENVIRONMENTAL REGULATIONS.

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

-----  
10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION  
-----

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME NICKEL

HAZARD CLASS ORM-E

LABELS NONE

REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)





## 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ZINC

FORMULA: ZN

FORMULA WT: 65.37

CAS NO.: 7440-66-6

NIOSH/RTECS NO.: ZG8600000

COMMON SYNONYMS: BLUE POWDER

PRODUCT CODES: 4244,4290,4240,4252,4260,4248,4274,5828,4264,4270

EFFECTIVE: 06/25/86

REVISION #02

### PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE

FLAMMABILITY - 1 SLIGHT

REACTIVITY - 2 MODERATE

CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

### LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

### PRECAUTIONARY LABEL STATEMENTS

WARNING

CAUSES IRRITATION

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER

HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SOLUBILITY(H<sub>2</sub>O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY  
VOLUME: 0

APPEARANCE & ODOR: BLUISH-WHITE ODORLESS SOLID.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

UNUSUAL FIRE & EXPLOSION HAZARDS

REACTS VIOLENTLY WITH WATER LIBERATING AND IGNITING HYDROGEN.

-----  
5 - HEALTH HAZARD DATA  
-----

THRESHOLD LIMIT VALUE (TLV/TWA): 10 MG/M<sup>3</sup> ( PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.

INHALATION OF DUST MAY CAUSE IRRITATION TO UPPER RESPIRATORY  
TRACT.

PROLONGED EXPOSURE MAY CAUSE DERMATITIS.

NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON  
INHALATION

STABILITY: UNSTABLE  
OCCUR

HAZARDOUS POLYMERIZATION: WILL NOT

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, STRONG BASES, STRONG OXIDIZING  
AGENTS,

ALKALI METALS, HALOGENATED HYDROCARBONS

DECOMPOSITION PRODUCTS: OXIDES OF ZINC

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND  
REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND  
LOCAL  
ENVIRONMENTAL REGULATIONS.

-----  
8 - PROTECTIVE EQUIPMENT  
-----

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST  
VENTILATION

TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE  
VENTILATION

CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS  
HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

-----  
MSDS for ZINC

Page 4  
-----

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME    CHEMICALS, N.O.S. (NON-REGULATED)



**ATTACHMENT B**  
**HEALTH AND SAFETY STANDARD OPERATING PROCEDURES**

---





## **OPERATING PROCEDURES NO. HS-201**

### **201.0 HEAT STRESS**

#### **201.1 PURPOSE**

The purpose of this Operating Procedure is to provide general information on heat stress and the methods that can be utilized to prevent or minimize the occurrence of heat stress.

Adverse climatic conditions are important considerations in planning and conducting site operations. Ambient temperature effects can include physical discomfort, reduced efficiency, personal injury, and increased accident probability. Heat stress is of particular concern while wearing impermeable protective garments, since these garments inhibit evaporative body cooling.

#### **201.2 TYPES OF HEAT STRESS**

Heat stress is the combination of environmental and physical work factors that constitute the total heat load imposed on the body. The environmental factors of heat stress are the air temperature, radiant heat exchange, air movement, and water vapor pressure. Physical work contributes to the total heat stress of the job by producing metabolic heat in the body in proportion to the intensity of the work. The amount and type of clothing also affects heat stress.

Heat strain is the series of physiological responses to heat stress. When the strain is excessive for the exposed individual, a feeling of discomfort or distress may result, and, finally, a heat disorder may ensue. The severity of strain will depend not only on the magnitude of the prevailing stress, but also on the age, physical fitness, degree of acclimatization, and dehydration of the worker.

Heat disorder is a general term used to describe one or more of the heat-related disabilities or illnesses shown in Table 201-1.

### 201.3 METHODS OF CONTROLLING HEAT STRESS

As many of the following control measures, as appropriate, should be utilized to aid in controlling heat stress:

- Provide for adequate liquids to replace lost body fluids. Encourage personnel to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.
- Replace body fluids primarily with water, with commercial mixes such as Gatorade or Quick Kick used only as a portion of the replacement fluids. Avoid excessive use of caffeine drinks such as coffee, colas or tea.
- Establish a work regimen that will provide adequate rest periods for cooling down. The heat exposure Threshold Limit Values (TLV) may be used for guidelines.
- Provide shaded work areas, if possible.
- Wear cooling devices such as vortex tubes or cooling vests.
- Consider adjusting work hours to avoid the worst heat of the day.
- Take breaks in a cool rest area.
- Remove any impermeable protective garments during rest periods.
- Do not assign other tasks to personnel during rest periods.
- Inform personnel of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

## 201.6 MONITORING

### 201.6.1 Temperature

The environmental heat stress of an area can be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique. When heat stress is a possibility, a heat stress monitoring device, such as the Wibget Heat Stress Monitor (Reuter Stokes) can be utilized.

The WBGT shall be compared to the TLV outlined by the American Conference of Governmental Industrial Hygienists (ACGIH) TLV guides, and a work-rest regiment can be established in accordance with the WBGT. Note that approximately 5°C must be subtracted from the TLVs listed for heat stress to compensate for the wearing of impermeable protective clothing.

### 201.6.2 Medical

In addition to the provisions of the Woodward-Clyde (W-C) medical surveillance program, on-site medical monitoring of personnel should be performed for projects where heat stress is a significant concern. Blood pressure, pulse, body temperature (oral), and body weight loss may be utilized.

**Heart Rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third. If the heart rate still exceeds 110 beats per minute at the next rest cycle, shorten the following work cycle by one-third.

**Oral Temperature:** Use a clinical thermometer or similar device to measure the oral temperature at the end of the work period (before drinking liquids). If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

Do not permit a worker to wear a semipermeable or impermeable garment if his/her oral temperature exceeds 100.6°F (38.1°C).

**Body Water Loss:** Measure body weight on a scale accurate to  $\pm 0.25$  pounds at the beginning and end of each work day (also at lunch break, if possible) to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

**Physiological Monitoring:** Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. The length of the work cycle will be governed by the frequency of the required physiological monitoring.

## 201.7 REFERENCES

American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents, 1992-1993.

EPA, Standard Operating Safety Guides, 1992, Pages 91-93.

National Institute for occupational Safety and Health, Criteria for a Recommended Standard: Occupational Exposure to Hot Environments, 1986.

**TABLE 201-1**  
**Classification, Medical Aspects, and Prevention of Heat Illness**

Category and Clinical Features	Predisposing Factors	Underlying Physiological Disturbances	Treatment	Prevention
<b>Temperature Regulation Heatstroke</b>  <b>Heatstroke:</b> (1) Hot, dry skin; usually red, mottled, or cyanotic; (2) rectal temperature 40.5°C (104°F) and over; (3) confusion, loss of consciousness, convulsions, rectal temperature continues to rise; fatal if treatment is delayed	(1) Sustained exertion in heat by unacclimatized workers; (2) lack of physical fitness and obesity; (3) recent alcohol intake; (4) dehydration; (5) individual susceptibility; and (6) chronic cardiovascular disease	Failure of the central drive for sweating (cause unknown) leading to loss of evaporative cooling and an uncontrolled accelerating rise in $t_{re}$ ; there may be partial rather than complete failure of sweating	Immediate and rapid cooling by immersion in chilled water with massage or by wrapping in wet sheet with vigorous fanning with cool dry air; avoid overcooling; treat shock if present	Medical screening of workers, selection based on health and physical fitness; acclimatization for 5-7 days by graded work and heat exposure; monitoring workers during sustained work in severe heat
<b>Circulatory Hypostasis Heat Syncope</b>  Fainting while standing erect and immobile in heat	Lack of acclimatization	Pooling of blood in dilated vessels of skin and lower parts of body	Remove to cooler area; rest in recumbent position; recovery prompt and complete	Acclimatization; intermittent activity to assist venous return to heart
<b>Water and or Salt Depletion</b>  <b>(a) Heat Exhaustion</b>  (1) Fatigue, nausea, headache, giddiness; (2) skin clammy and moist; complexion pale, muddy, or hectic flush; (3) may faint on standing with rapid thready pulse and low blood pressure; (4) oral temperature normal or low, but rectal temperature usually elevated (37.5-38.5°C or 99.5-101.3°F); water restriction type: urine volume small, highly concentrated; salt restriction type: urine less concentrated chlorides less than 3 g/L  <b>(b) Heat Cramps</b>  Painful spasms of muscles used during work (arms, legs, or abdominal); onset during or after work hours	(1) Sustained exertion in heat; (2) lack of acclimatization; and (3) failure to replace water lost in sweat  (1) Heavy sweating during hot work; (2) drinking large volumes of water without replacing salt loss	(1) Dehydration from deficiency of water; (2) depletion of circulating blood volume; (3) circulatory strain from competing demands for blood flow to skin and to active muscles  Loss of body salt in sweat, water intake dilutes electrolytes; water enters muscles, causing spasm	Remove to cooler environment; rest in recumbent position; administer fluids by mouth; keep at rest until urine volume indicates that water balances have been restored  Salted liquids by mouth or more prompt relief by IV infusion	Acclimatize workers using a breaking-in schedule for 5-7 days; supplement dietary salt only during acclimatization; ample drinking water to be available at all times and to be taken frequently during work day  Adequate salt intake with meals; for unacclimatized workers, supplement salt intake at meals.

**TABLE 201-1 (continued)**  
**Classification, Medical Aspects, and Prevention of Heat Illness**

Category and Clinical Features	Predisposing Factors	Underlying Physiological Disturbances	Treatment	Prevention
<b>Skin Eruptions</b>  (a) <u>Heat Rash</u> (miliaria rubra, or "prickly heat")  Profuse tiny raised red vesicles (blisterlike) on affected areas; prickling sensations during heat exposure  (b) <u>Anhidrotic Heat Exhaustion</u> (miliaria profunda)  Extensive areas of skin which do not sweat on heat exposure, but present gooseflesh appearance, which subsides with cool environments; associated with incapacitation in heat	Unrelieved exposure to humid heat with skin continuously wet from unevaporated sweat   Weeks or months of constant exposure to climatic heat with previous history of extensive heat rash and sunburn	Plugging of sweat gland ducts with sweat retention and inflammatory reaction   Skin trauma (heat rash; sunburn) causes sweat retention deep in skin; reduced evaporative cooling causes heat intolerance	Mild drying lotions; skin cleanliness to prevent infection   No effective treatment available for anhidrotic areas of skin; recovery of sweating occurs gradually on return to cooler climate	Cool sleeping quarters to allow skin to dry between heat exposures   Treat heat rash and avoid further skin trauma by sunburn; provide periodic relief from sustained heat
<b>Behavioral Disorders</b>  (a) <u>Heat Fatigue - Transient</u>  Impaired performance of skilled sensorimotor, mental, or vigilance tasks, in heat  (b) <u>Heat Fatigue - Chronic</u>  Reduced performance capacity; lowering of self-imposed standards of social behavior (e.g., alcoholic over-indulgence); inability to concentrate, etc.	Performance decrement greater in unacclimatized and unskilled worker   Workers at risk come from temperature climates for long residence in tropical latitudes	Discomfort and physiologic strain   Psychosocial stresses probably as important as heat stress; may involve hormonal imbalance but no positive evidence	Not indicated unless accompanied by other heat illness   Medical treatment for serious causes; speedy relief of symptoms on returning home	Acclimatization and training for work in the heat   Orientation on life in hot regions (customs, climate, living conditions, etc.)



## **OPERATING PROCEDURE NO. HS-212**

### **212.0 NOISE/HEARING CONSERVATION**

#### **212.1 PURPOSE**

The purpose of this Operating Procedure (OP) is to establish Woodward-Clyde (W-C) procedures and responsibilities for the administration of a hearing conservation program. A proper hearing conservation program will reduce the risk of occupationally induced hearing loss and provide education and guidance for the prevention of "lifestyle" induced hearing loss.

#### **212.2 HAZARD INFORMATION**

Excessive noise exposure can cause both temporary and permanent effects on hearing. The temporary effects of excessive noise include ringing in the ears, interference with communication, and hearing threshold changes. The effect of long-term excessive noise includes varying degrees of noise induced hearing loss.

The damaging effects of noise are dependent on the noise intensity (decibels), the time of exposure, the noise frequency (Hertz), and individual susceptibility. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) set exposure limits based on exposure per day (in hours) and sound intensity (in decibels A scale or dBA). Exposures above these limits require use of hearing protection (plugs or muffs) to reduce the sound level or the use of noise engineering controls to reduce the sound level.

It is known that noise intensity above 85 dBA for prolonged periods will induce hearing loss. Eighty-five dBA represents a noise level where normal conversation is difficult and individuals will be shouting or talking into the ear of the person to be understood.



### **212.3 REQUIREMENTS**

OSHA regulations issued in late 1981 require a hearing conservation program for workers exposed to 85 dBA as an 8-hour time-weighted average.

The OSHA regulation addresses several requirements for a good hearing conservation program. These requirements are as follows:

- Noise exposure monitoring
- Audiometric testing
- Hearing protectors
- Training programs
- Access to information
- Recordkeeping and posting

### **212.4 RESPONSIBILITIES**

Each employee has the responsibility to comply with all aspects of this Operating Procedure. Managers with input from the Health and Safety Officer (HSO)'s and Site Safety Officer (SSO)'s are responsible for enforcing the provisions of this Operating Procedure as it applies to field work. Scheduling of audiograms (accomplished through Medical Surveillance) and training are the responsibility of the HSO and Corporate Health and Safety Officer (CHSO).

### **212.5 NOISE EXPOSURE MONITORING**

The SSO with assistance from the HSO and/or CHSO will determine when noise monitoring is required for jobs where W-C employees are potentially exposed to excessive noise. The SSO/HSO will perform noise monitoring as necessary and make recommendations to assure compliance with Section 212.3 of this Operating Procedure. Engineering controls, ear protection, and posting may be required to comply with Section 212.3. In jobs where W-C is working in a client's noisy area, W-C personnel will comply with the client's existing hearing conservation program. If a client has a

noisy area and has no hearing conservation program, W-C will establish a plan for its employees and subcontractors to be in compliance with Section 212.3.

#### **212.6 TRAINING**

All workers required to wear hearing protectors will be trained in their proper use. In addition, all workers who may be exposed to greater than 85 dBA will be provided refresher training. This training will include at least the following: (1) Effects of noise on hearing; (2) the purpose, selection, fitting, use and care of hearing protectors; and (3) the purpose of audiometric testing and an explanation of the test procedure.

#### **212.7 HEARING PROTECTORS**

When hearing protectors are required the employee must have received training on the proper use. Proper noise reduction ratings will be applied by the HSO/CHSO to the noise in the environment.

Hearing protectors act as barriers to reduce sound entering the ear. Noise Reduction Ratings (NRR) for each product reflects the effectiveness of the protector chosen. Generally, muffs offer a greater NRR (25-30 dBA) than plugs (15-25 dBA). Comfort is an important factor when wearing ear protection over many hours; it is recommended to try different types of plugs or muffs to determine the best combination of comfort and fit.

#### **212.8 AUDIOMETRIC TESTING**

Audiograms are administered upon employment and annually/biennially thereafter. The audiograms are conducted by the medical clinics approved for W-C physicals and must meet all the applicable requirements (including Appendices C, D, and E of the OSHA Std. Title 29 Code of Federal Regulations (CFR) 1910.95). The local medical clinic in consultation with Greaney Medical will comply with applicable provisions of Title 29 CFR 1910.95(g) with regard to recordkeeping.

## **212.9 ACCESS TO INFORMATION, RECORDKEEPING**

Each office shall have a copy of Title 29 CFR 1910.95 available for any employee requesting access to the standard. Employee training aids shall also be available to any employee. All noise monitoring data shall be retained for at least two years and Greaney Medical shall maintain the audiometric results for thirty years beyond the last date of employment.



## **OPERATING PROCEDURE NO. HS-213**

### **213.0 TICKS AND TICK-BORNE DISEASES**

#### **213.1 PURPOSE**

The purpose of this Operating Procedure (OP) is to provide information to Woodward-Clyde (W-C) employees regarding the diseases transmitted by ticks, particularly Lyme disease, and how to reduce employee risk.

#### **213.2 TICK-BORNE DISEASES**

Tick-borne diseases represent a significant health risk in many parts of the world. The risk to W-C field staff depends on the work location, the time of year, the clothing worn and other factors. Ticks are documented vectors of virus and bacteria for diseases such as Lyme disease (North America, Europe), Rocky Mountain Spotted Fever (North America), Encephalitis, (Asia, Africa), Boutonneuse Fever (Africa, India, Middle East), and Rickettsiosis (Asia).

While specific information in this OP is limited to Lyme disease, the risk control measures apply to other tick-borne diseases.

#### **213.3 LYME DISEASE**

Lyme disease is caused by a coiled bacteria known as a spirochete and is most commonly transferred to humans through ticks. The disease has been found in almost all U.S. states and in Europe, but is most common in locations with a mixture of wooded areas and grasslands. The Lyme disease infection is spread in the wild by tick bites on animals, particularly mice and deer, and infection can include domestic animals such as cats, dogs, and cows. While a number of ticks can transfer Lyme disease, the very small deer tick is the most common.

Woodward-Clyde

Revised: 10/93

The tick bite is usually not painful and because of the small size of the deer tick, is often not noticed. In most cases, the tick simply draws blood for its nourishment and after a few days drops off. If the tick is infected with the Lyme disease bacteria, it may be transmitted during this feeding process.

### **213.3.1 Lyme Disease Symptoms**

A typical early symptom of infection is a slowly expanding red rash. The rash often starts as a flat or raised red area and slowly expands after several days, with partial central clearing, resulting in a red ring appearance. While most people will develop an observable red rash, some Lyme disease victims may lack this symptom.

Other common early symptoms of Lyme disease include fatigue, headache, muscle aches, neck stiffness, fever, and swollen glands.

Later symptoms, if untreated, include joint pain and swelling, nervous system problems, heart complications, and other effects. These later symptoms usually occur one to four months after the original infection and can result in permanent health effects.

### **213.3.2 Lyme Disease Treatment**

Lyme disease is easily treated by use of antibiotics when detected early. Individuals that develop a rash or experience other early symptoms of Lyme disease should promptly see a physician for treatment. Although the disease is more difficult to treat if further advanced, it is still treatable using larger antibiotic (usually intravenous) doses.

### **213.3.3 Reducing Lyme Disease Risk**

Field personnel can reduce the risk of tick-borne diseases through proper clothing, use of repellents, use of good work practices, and recognizing early symptoms.

Field personnel in grassy or wooded areas should wear long pants, long sleeved shirts (tucked in), hat, and consider taping or cinching clothing at the ankles. Work in areas of known high tick concentrations (e.g. wetland areas) should consider use of Tyvek coveralls taped at the ankles and wrists.

Follow label directions carefully for use of tick repellents as many are designed for use on clothing, not on skin. Repellent use should be in combination with proper clothing and is most recommended for the ankles and wrists.

After working in an area of possible tick exposure, it is recommended that the individual shower promptly and check for any ticks. If a tick is found on the skin, remove it promptly using tweezers or forceps, followed by disinfection with alcohol or iodine. It takes several hours for a tick to attach and feed; removing it promptly lessens the chance of being infected.





## **OPERATING PROCEDURE NO. HS-501**

### **501.0 EMPLOYEE MEDICAL SURVEILLANCE**

#### **501.1 PURPOSE**

Medical surveillance is a major component of the Woodward-Clyde (W-C) health and safety program. It was established to monitor and promote the health of employees engaged in projects which have the potential for exposure to hazardous substances.

#### **501.2 OBJECTIVES**

The objectives of the medical surveillance component of the health and safety program are:

- To reduce the health risk for employees assigned to work on hazardous material projects.
- Pre-assignment screening of employee's health to determine present status and to identify existing problems that may be aggravated by chemical exposures or physical stress.
- Monitoring employee health for early signs of work-related illness and employee suitability for further field or laboratory assignments on sites containing potentially hazardous substances.
- Evaluation and care of individuals with work-related illnesses or injuries.
- Satisfy the requirements of Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations (CFR) 1910.134 regarding respiratory protection and OSHA 1910.120 for hazardous waste workers.

### 501.3 RESPONSIBILITIES OF W-C OPERATING UNITS

Each Operating Unit, through its Health and Safety Officer (HSO)/Health and Safety Coordinator (HSC), must comply with the medical surveillance provisions of the health and safety program. It is the responsibility of the Operating Unit Manager and HSO/HSC to assure that the following activities are punctually and thoroughly conducted.

- Identify personnel within the Operating Unit required to enter the program.
- Inform participants of the specific arrangements for scheduling and receiving medical examinations in cooperation with Greaney Medical Group
- Comply with the examining and/or the reviewing physician's recommendations regarding work restrictions and attending to all work-related illnesses.
- Document and report work/exposure histories for all employees engaged in field activities.

### 501.4 REQUIREMENTS

Under 1910.120, OSHA requires medical surveillance for personnel involved in hazardous waste operations. OSHA states that persons should not be assigned to tasks unless it has been determined that they are physically able to perform the work and use the equipment.

The OSHA program has two essential components: routine health care and emergency treatment. Routine health care and maintenance shall consist of at least:

- Post-offer medical examinations to establish the individual's state of health, baseline physiological data, and ability to wear personal protective equipment. The frequency and type of examination to be conducted thereafter should be determined by medical personnel knowledgeable in the area of occupational medicine.

- Arrangements to provide special medical examinations, care, and counseling in case of known or suspected exposures to toxic substances. Any special tests performed depend on the chemical substance to which the individual has been exposed.

The site safety plan must address emergency medical care and treatment of personnel, including possible exposures to toxic substances and injuries due to physical hazards. The following items should be considered in emergency care provisions.

- The name, address, and telephone number of the nearest medical treatment facility should be conspicuously posted. A map and/or directions for locating the facility, plus the travel time, should be readily available.
- The facility's ability to provide care and treatment of personnel exposed or suspected of being exposed to toxic (or otherwise hazardous) substances should be ascertained.
- Arrangements should be made to quickly obtain ambulance, emergency, fire, and police services. Telephone numbers and procedures for obtaining these services should be conspicuously posted.
- Emergency showers, eye wash fountains, and first aid equipment should be readily available on-site. The Site Safety Officer (SSO) should have first aid training.
- Provisions should be made for rapid identification of the substance to which the worker has been exposed (if this has not previously been done). This information must be provided to medical personnel.

Under Part 1910.134, OSHA requires medical clearance for those required to wear respirators. Individuals with existing health conditions, such as emphysema, may be excluded from respirator use due to potential health effects.

## **501.5 MEDICAL EXAMINATIONS**

### **501.5.1 Initial Baseline Examination**

All applicable employees shall be given a baseline examination before being assigned to work at sites containing potentially hazardous substances. The purpose of the baseline examination is pre-assignment screening. In some instances a recent exit examination (within the past two months) from another employer may be used as a baseline examination. If an exit examination is used, the new employee should complete the questionnaire and back cover of the initial examination folder and enclose the results of the exit examination and send it Greaney Medical Group.

### **501.5.2 Routine Examinations**

All personnel who have taken the initial baseline examination and have received clearance by the examining and/or reviewing physician to participate in field or laboratory activities shall be re-examined on an annual or biennial basis. Generally, employees with less than 100 hours of annual hazardous waste field work will have biennial examinations. Employees with greater than 100 hours hazardous waste field work will have annual examinations. The reviewing physician will have final authority in regard to examination frequency.

### **501.5.3 Exit Examination**

An exit examination shall be given to any employee whose employment with W-C has included hazardous materials work and who has been a participant in medical surveillance. The exit examination may be waived if the most recent examination was in the past six months.

### **501.5.4 Special Testing**

Special testing may be required on certain projects due to the potential for exposure to specific substances. The need for special testing will be assessed on a project-by-project and/or individual employee basis. Examples of special testing conditions include sites containing asbestos, arsenic, or lead where specific OSHA medical requirements for these compounds are in effect. Special testing should be cleared and scheduled by Greaney Medical Group.

Woodward-Clyde

Revised: 11/93

HS-501-4

## **501.6 EXAMINATION PROTOCOLS**

The protocols presented in Table 501-1 apply to baseline, annual, and exit examinations. A detailed health/work history questionnaire is provided before baseline and routine examinations. The protocols may be expanded by the reviewing or examining physician after consultation with W-C.

## **501.7 EXAMINING PHYSICIAN**

Examining physicians will review the information provided by the employee in the questionnaire, examine the employee, and perform laboratory tests. The examining physician will provide the results of the examination to the W-C reviewing physician for final evaluation of employee suitability for work at hazardous material sites. The reviewing physician's conclusions shall supersede those of the examining physician. The examining physician will be contracted directly to Greaney Medical Group.

## **501.8 REVIEWING PHYSICIAN**

Dr. Peter Greaney, Greaney Medical Group of Anaheim, California has been retained to provide medical oversight to the W-C medical surveillance program. The reviewing physician receives copies of all medical questionnaires, examinations, and laboratory testing results, reviews the reports of examining physicians, and determines an employee's fitness for work at hazardous material sites. The reviewing physician also provides advice and assistance regarding site specific medical monitoring needs and programs.

### **501.8.1 Greaney Medical Group**

Greaney Medical Group (GMG) will provide the following services:

- contact the W-C employee for appointment availability
- schedule appointment with appropriate clinic

- notify HSO/HSC and clinic of confirmed appointment by faxing a copy of the Appointment Confirmation Form (see Table 501-3). This form will list the employee's name, the examining physician's office, the date and time of the exam, and the tests and procedures to be performed as determined by Dr. Peter Greaney.
- contract with examining clinics
- contract with a single laboratory for specimen analysis.
- supply examining clinics with collection kits and overnight shipping envelopes
- invoice each W-C/WCFS Operating Unit for examined employees
- provide employee reports to the examined employee
- provide employer reports to the HSO/HSC

Table 501-2 provides an overview of the GMG/W-C medical program responsibilities.

## **501.9 PHYSICIAN'S REPORTS**

The reviewing physician will send a letter outlining the results of the examination directly to the employee with a separate report (see Table 501-4 Health Status Medical Employer Report) stating ability to work at hazardous material sites sent to W-C.

Employer reports received by W-C shall be reviewed by the HSO and kept in the Operating Unit's health and safety file. Physician recommendations regarding limitations must be followed.

### **501.9.1 Not Qualified Reports**

In the event that a **not qualified** status is determined or prompt medical attention is needed for an employee, GMG will notify the employee and the HSO by phone immediately.

If a W-C employee does not take a W-C physical examination and the GMG staff has made three attempts to contact the employee over a one month period, GMG will issue a Not Qualified - Health Status Medical Employer Report.

#### **501.10 EMPLOYEE MEDICAL SURVEILLANCE PROGRAM DATABASE**

The employee medical surveillance program includes a computerized database which stores and processes employee medical surveillance information such as medical clearance results, training and respirator fit testing data. The purpose of the database is to facilitate record documentation, the reviewing physician's evaluation of the medical surveillance data, and administration of the W-C Health and Safety Program. Administrative and quality control features include: profile reports on employee eligibility for site work, medical examination scheduling reports, training requirement notices, and listing of qualified staff by operating unit and firmwide. The reports are shown as part of Table 501-2.

#### **501.11 CONFIDENTIALITY - MEDICAL RECORDS**

Employee medical records are confidential and available for review only by the examining and/or reviewing physicians and their medical personnel. Only the work clearance status and any work limitations are provided to W-C.

Each employee can obtain information on his/her health by asking the examining physician for the information at the time of, or after, an examination. The employee may also request release of records or information, and/or designate a representative, in a letter to the physician. The request must contain the full name and address of the representative and indicate the records to be released. Medical information about an employee will not be made available to anyone without authorization from the individual concerned.

## **501.12 DRUG TESTING**

The guidelines outlined in the W-C Personnel Manual PERS-107 "W-C Substance Abuse Policy" shall be followed. It is the responsibility of the HSO/HSC to schedule drug testing. Employees required to take a drug test should be notified in writing of the drugs to be included in the test and threshold levels for each of the drugs (see Table 501-5). Drug testing is not a regular part of the W-C Medical Surveillance Program; the testing is only conducted when required by clients, Department of Transportation (DOT) requirements or for cause.

## **501.13 FINANCIAL RESPONSIBILITY**

The costs of baseline, routine, special and exit examinations, and reviewing physician will be paid by W-C Operating Units. The cost of examinations and tests that the employee voluntarily takes on recommendations by the examining or reviewing physician shall be borne by the employee unless the examinations/tests are related to the employee ability to work or to diagnose a work-related illness. The cost of the medical surveillance program database will be paid by WCGI Health and Safety.



TABLE 501-1  
MEDICAL EXAMINATION PROTOCOL  
pg 1 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Height and Weight	X	X	X	
Blood Pressure	X	X	X	
Pulse (resting)	X	X	X	
Temperature (oral) Fahrenheit	X	X	X	
Vision Snellen (R&L)		X	X	
Vision Titmus (R&L)	X			
Near-corrected & Uncorrected Far-corrected & Uncorrected Peripheral (Visual Field) Color				
Audiogram	X	X	X	
Pulmonary Function Test	X	X	X	
CBC Count (Hemogram)	X	X	X	
WBC				
RBC				
HGB				
HCT				
MCV				
MCH				
MCHC				

TABLE 501-1  
MEDICAL EXAMINATION PROTOCOL  
pg 2 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Differential White Count	X	X	X	
Seg				
Band				
Lymph				
Mono				
Eosin				
Baso				
Platelets				
Platelet Count				
Reticulocyte Count	X	X	X	
Chest X-ray	X	*See	*Note	Every 3 years for less

Remarks  
than or  
equal to 40 years old.  
Every 2 years for more  
than or equal to 40  
years old to less than or  
equal to 55 years old.  
Every year for more  
than 55 years old.

\*NOTE: For Exit  
exams chest x-ray  
performed only if not  
performed in past year.

TABLE 501-1  
MEDICAL EXAMINATION PROTOCOL  
page 3 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Cardiogram	X	*See Remarks	*Note	<p>Every 3 years for less than or equal to 40 years old. Every year for more than 40 years old.</p> <p>*NOTE: For Exit exam, EKG performed only if not performed in past year.</p>
Treadmill	*See Remarks	*See Remarks		<p>Only if: *Abnormal EKG (except sinus bradycardia, unless an otherwise healthy person) <u>or</u> *History of angina <u>or</u> *History of myocardial infarction (MI) <u>or</u> *History of cardiac surgery.</p>

TABLE 501-1  
MEDICAL EXAMINATION PROTOCOL  
page 4 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Urinalysis	X	X	X	
Appearance	Urobilinogen			
Color	L. Esterase			
pH	WBC			
Ketones	RBC			
Direct Bilirubin Casts				
Total Bilirubin Mucus				
Glucose	Bacteria			
Blood	Epithelial			
Blood Chemistry Panel	X	X	X	
<u>Required:</u>				
Glucose	Sodium			
Potassium	Chloride			
BUN	Creatinine			
Uric Acid	Phosphate			
Calcium	Cholesterol			
Triglycerides	Total Protein			
Albumin	Globulin			
Total Bilirubin				
Alk. Phosphatase				
G-Glutamyl Transpep.				
Transaminase, SGO				
Transaminase, SGP				
LDH				

**TABLE 501-5**  
**NIDA 5 DRUG TESTING THRESHOLD LEVELS**

	<u>Screening Limit</u>	<u>Confirming Limit</u>
Cocaine	300 ng/mls	150 ng/mls
Marijuana Cannabinoids	100 ng/mls	15 ng/mls
Opiates	300 ng/mls	300 ng/mls
Phencyclidine (PCP)	25 ng/mls	25 ng/mls
Amphetamines	1000 ng/mls	500 ng/mls

Source for NIDA 5 Levels - SmithKline Bio-Science Laboratories; "Substance of Abuse-Testing in the Workplace".

- NOTES:
1. Clients that require drug testing will list drugs and threshold levels in their contract. If the contract states NIDA 5 testing, then the above list can be used.  
  
When the threshold level for marijuana is lower than the above referenced levels, then the client is probably testing for passive use.
  2. DOT testing requires the NIDA 5.
  3. Drug testing is not part of the standard W-C Medical Surveillance Program. Drug testing is performed due to client or DOT requirements or for cause.



## **OPERATING PROCEDURE NO. HS-102**

### **102.0 INCIDENT REPORTS**

#### **102.1 PURPOSE**

All health and safety incidents shall be reported to Woodward-Clyde (W-C) management and health and safety staff. The prompt investigation and reporting of incidents will reduce the risk of future incidents, better protect W-C employees, and reduce W-C liability.

#### **102.2 DEFINITIONS**

A health and safety incident is any event listed below:

- Illness resulting from chemical exposure or suspected chemical exposure.
- Physical injury, including both those that do and do not require medical attention to W-C employees or W-C subcontractors.
- Fire, explosions, and flashes resulting from activities performed by W-C and its subcontractors.
- Property damage resulting from activities performed by W-C and its subcontractors.
- Vehicular accidents occurring on-site, while travelling to and from client locations, or with any company-owned vehicle.
- Infractions of safety rules and requirements.
- Unexpected chemical exposures.
- Complaints from the public regarding W-C field operations.

#### **102.3 REPORTING PROCEDURES**

##### **102.3.1 Reporting Format**

Incident reports shall be prepared by completing Form HS-102. This form may be obtained from any W-C Health and Safety Officer (HSO) and is attached to this operating procedure.

#### **102.3.2 Responsible Party**

Reports of incidents occurring in the field shall be prepared by the Site Safety Officer or, in the absence of the site safety officer, the supervising field engineer, witness, or injured/exposed individual.

#### **102.3.3 Filing**

A report must be submitted to the Health and Safety Officer of the Operating Unit to which the Project Manager belongs within 24 hours of each incident involving medical treatment. In turn, the Health and Safety Officer must distribute copies of the report to the Corporate Health and Safety Manager and the Corporate Health and Safety Officer. When an injury or illness is reported, the Health and Safety Officer must deliver a copy of the report to the individual in charge of Human Resources so that a Worker's Compensation Insurance Report can be filed if necessary. Reports must be received by Human Resources within 48 hours of each qualifying incident.

#### **102.3.4 Major Incidents**

Incidents that include fatalities, hospitalization of employees or subcontractors, or involve injury/illness of the public shall be reported to the HSO and Project Manager as soon as possible. Any contact with the media should be referred to the Project Manager and Operating Unit Manager.



**FORM HS-102**  
**W-C HEALTH AND SAFETY INCIDENT REPORT**

Project Name: \_\_\_\_\_

TYPE OF INCIDENT (Check all applicable items)

Project Number: \_\_\_\_\_

☐ Illness

☐ Fire, explosion, flash

Date of Incident: \_\_\_\_\_

☐ Injury

☐ Unexpected exposure

Time of Incident: \_\_\_\_\_

☐ Property Damage

☐ Vehicular Accident

Location: \_\_\_\_\_  
\_\_\_\_\_

☐ Health & Safety Infraction

☐ Other (describe) \_\_\_\_\_

**DESCRIPTION OF INCIDENT** (Describe what happened and possible cause. Identify individual involved, witnesses, and their affiliations; and describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.)

---

---

---

---

---

---

---

---

---

---

---

---

Reporter: \_\_\_\_\_  
Print Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Reporter must deliver this report to the Operating Unit Health & Safety Officer within 24 hours of the reported incident for medical treatment cases and within five days for other incidents.

Reviewed by: \_\_\_\_\_  
Operating Unit Health & Safety Officer

\_\_\_\_\_  
Date

Distribution by HSO:

- WCGI Corporate Health and Safety Manager
- Corporate Health and Safety Officer
- Project Manager
- Personnel Office (medical treatment cases only)

SOP 301,302,303

---

## OPERATING PROCEDURE NO. HS-301

### 301.0 SELECTION AND USE OF RESPIRATORY PROTECTION EQUIPMENT

#### 301.1 PURPOSE

The purpose of this Operating Procedure (OP) is to provide information for the proper selection of respiratory protection equipment. It is to insure that respirators are properly selected and used in accordance with Occupational Health and Safety Administration (OSHA) requirements. Respirators must be selected on the basis of the hazards to which personnel are or may potentially be exposed.

#### 301.2 REQUIREMENTS

The OSHA standards found in Title 29 of the Code of Federal Regulations, Section 1910.134 establishes requirements for respiratory protection programs, which is summarized in the following eleven major points:

1. Establish Written Operating Procedures - A formal written document outlining aspects of the respiratory protection program must be developed.
2. Respirator Selection - Proper selection of respirators shall be made according to the guidance of American National Standards Institute (ANSI) Z88.2-1980. In choosing respirators, consider the nature and extent of the hazard, the work requirements and conditions, and the characteristics and limitations of the respirators available. When examining the hazardous environment, some of the questions that should be asked are:
  - What are the contaminants?
  - What are their concentrations?
  - Are they gaseous or particulate?
  - Do they have adequate warning properties?
  - Are concentrations immediately dangerous to life or health?
  - Does the air contain at least 19.5 percent oxygen?

- Are protective clothing and hand protection necessary?

3. Training - Users of respirators should be trained in how to select, use, clean, maintain, and store their respirators. Such training must provide the respirator user with an opportunity to handle the respirator, have it properly fitted, test its facepiece-to-face seal, wear it in normal air for a long familiarity period, and finally, wear it in a test atmosphere. Every respirator wearer must receive fitting instructions, including demonstrations and practice in how to determine if it fits properly.
4. Assign Individual Respirators Where Practical - When respirators are assigned individually, there is less chance that a worker will use one that does not give him or her the best protection. Sometimes it overcomes the unwillingness of an employee to wear a respirator if he or she thinks someone else has used it, and that it was not properly sanitized afterward.
5. Regularly Clean and Sanitize Respirators - There is a three-step method of washing the respirator in a detergent or cleaner-sanitizer, rinsing it in warm water, and air drying it.
6. Respirator Storage - Storing respirators in clean plastic bags or other suitable containers in a clean and sanitary location maintains the integrity of the cleaning and maintenance program.
7. Respirator Inspection and Maintenance - Inspection and maintenance of respirators in accordance with the manufacturer's instructions will ensure that the respirators, when properly used, will give the wearer the best possible protection.
8. Monitor the Work Area - Make sure the right respirator is being used. If there is a change in materials, or processes, in the work area that change the concentration of contaminants, or creates completely different contaminants, changes must be made in the respirator program.
9. Continually Enforce and Evaluate the Respirator Program - No matter how well the written standard operating procedures are drawn up, the program cannot be effective if

it is not enforced. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained. If defects are found, corrective action should be taken.

10. Medical Evaluation of Respirator Wearers - If a potential respirator wearer is not physically able to perform the work using a respirator, the use of a respirator may create more problems than it solves. A physician should be consulted to make sure each respirator wearer is physically qualified.
11. Use Approved or Accepted Respirators - The respirators you use in your work environment must be National Institute of Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) certified, where applicable, or be otherwise accepted to provide adequate protection for the hazards encountered.

### 301.3 SELECTION

A summary diagram of the respirator selection process is presented in Figure 301-1. It provides an overview of the decision logic that should be used during selection of respiratory protection equipment. A listing of specific decision considerations is presented below.

1. What is the estimated contaminant concentration where the respirator will be used, as determined by industrial hygiene monitoring information.
2. What is the Permissible Exposure Limit (PEL) to the contaminant, Threshold Limit Value (TLV), and Short-Term Exposure Limit (STEL)?

Health standards for many specific substances are available. OSHA Standard 1910.1000, Tables Z1, Z2, and Z3 gives the required PEL's when no health standards supersede these tables. However, since these tables are established from the 1969 TLV list, good industrial hygiene practice would base respirator selection on current TLV's, if lower, or other new toxicity data.

3. Is the contaminant a gas, vapor, mist, dust or fume? This information can be determined by studying the manufacturing or maintenance process - raw materials, intermediate products, by-products and the wastes. See Material Safety Data Sheets when available.

4. Could the contaminant concentrations be termed Immediately Dangerous to Life or Health (IDLH)?

This knowledge is derived from the manufacturer of raw materials, the process engineer or chemist, the company or plant industrial hygienist, and Material Safety Data Sheets, when available. In addition, consideration should be given to the potential for contamination of atmospheres under abnormal or emergency conditions.

5. If the contaminant is flammable, does the estimated concentration approach the Lower Explosive Limit (LEL), or do dust concentrations create a potential explosion problem?

Besides creating a potential fire and explosion condition, in most situations flammable vapor or gas concentrations exceeding the LEL are IDLH. Plant gas or vapor levels can be determined with an explosion or combustible gas indicator (CGI). Here, too, consideration should be given to emergency (such as spill) conditions.

6. Does the contaminant have adequate warning properties?

Manufacturers can supply such information, directly or through Material Safety Data Sheets. Warning properties such as odor, irritation or taste should ideally be present at concentrations at or below the PEL.

7. Will the contaminant irritate the eyes at the estimated concentration?

Frequently, this will be self-evident if the operation is in progress. This information, too, is available from the Material Safety Data Sheets of raw materials. For irritant materials, a full facepiece respirator should be employed.

8. If the contaminant is a gas or vapor, is there any available sorbent that traps it efficiently?

Respirator manufacturers and/or industrial hygienists can provide this information.

9. Can the contaminant be absorbed through the skin as a vapor or liquid? If so, will it significantly add to the employee's exposure and cause injury?

Skin absorption is indicated in the OSHA Standard 1910.1000, Table Z1 by the notation "skin" after the material name. Material Safety Data Sheets will also indicate skin absorption potential.

10. What is the size of the employee's face?

Some manufacturers offer the same model respirator in two or three sizes. This will help to fit most employees properly with one brand of respirator.

11. What types of respirators will give the required Maximum Use Concentration (MUC)?

The MUC is a measure of the degree of protection provided by a respirator to a wearer. It takes into account the respirator limitations and the ability of a user to get a satisfactory fit. Multiplying the PEL (or STEL) by the protection factor assigned to a respirator gives the MUC of the hazardous material for which the respirator can be used.

$$\text{MUC} = \text{PEL} \times \text{Protection Factor}$$

A table of MUCs of various respirators for different contaminants is presented in Table 301-1.

#### 301.4 AIR-PURIFYING RESPIRATORS (APR)

#### 301.4.1 General Considerations and Limitations

- Chemical cartridge respirators shall not be used in environments Immediately Dangerous to Life or Health (IDLH) or in atmospheres containing less than 19.5 percent oxygen.
- Warning Properties of Contaminant - Chemical cartridge respirators shall not be used for exposures to air contaminants that cannot be easily detected by odor or irritations. For example, cartridge respirators should not be used to protect against methyl chloride or hydrogen sulfide. The former is odorless; and the later, while foul smelling, paralyzes the olfactory nerve so quickly that odor detection is unreliable.
- Eye Irritation - When working in environments where concentrations are irritating to the eyes, full facepiece respirators shall be used.
- Chemical cartridge respirators cannot be used for protection against gases that are not effectively stopped by chemical filters utilized; for example, carbon monoxide.

#### 301.4.2 Cartridge Selection

Select the cartridge or cartridge/filter group that best fits the type of exposure. **Using the wrong cartridge and filter may be like using no respirator at all.** For example, acid gas respirators cannot be used for protection against organic vapors. However, an organic vapor-acid gas respirator can be used for one or both of the exposures. Check and recheck the label on the cartridges to make sure the correct ones are issued.

#### 301.4.3 Respirator Use

- After correct cartridges have been selected, screw each cartridge into the facepiece after checking it for intactness; see OP HS-303, Respirator Inspection, Care, Maintenance and Storage. Make sure cartridge seals (usually part of packaging) have been removed.



- Fit the respirator as outlined in OP HS-302, Respirator Fit Testing.
- The cartridges may be used until the odor of the contaminant can be smelled, irritation occurs or the substance can be tasted by the wearer.
- Do not use cartridges after expiration date printed on the label.
- If the facepiece and cartridges are used by one employee and the cartridges are not used until exhaustion, they may be resealed after use, by the employee, and reused at a future time. This may be done until cartridge exhaustion.
- Inspect, clean and maintain respirators as outlined in OP HS-303, Respirator Inspection, Care, Maintenance and Storage.
- Most respirator manufacturers now supply a given model respirator in different sizes so that many employees can be fitted with a single brand of respirator.

### **301.5 SUPPLIED AIR RESPIRATORS**

#### **301.5.1 Self-Contained Breathing Apparatus (SCBA)**

The self-contained breathing apparatus affords complete respiratory protection in any atmosphere for which the lungs are the principal route of entry into the body. They supply the wearer with cool, non-contaminated breathing air, as demanded by the wearer, at approximately ambient atmospheric pressure. For specific instructions on SCBA units, consult the SCBA manufacturer's manual.

#### 301.5.1.1 Component Parts

- A cylinder and valve to contain a supply of compressed air.
- A high-pressure, flexible hose that routes the compressed air from the cylinder to the regulator.
- An audible alarm that rings to indicate low cylinder air pressure.
- A pressure-demand regulator that reduces the cylinder pressure to a breathable pressure and supplies the wearer with air in direct response to breathing requirements. All entry or re-entry into immediately dangerous or hazardous atmospheres require the use of a pressure-demand regulator.
- A facepiece assembly consisting of a rubber facepiece and lens, with head band, exhalation valve and breathing tube.
- A carrier and harness on which the cylinder is mounted and by which the entire apparatus is worn.

#### 301.5.1.2 General Check-Out Procedure

A check of the breathing apparatus is very important to ensure its proper operation. Keep records of these inspections. The following should be accomplished:

1. Put on breathing apparatus. Don facepiece.
2. Check its normal regulator cycling under exertion or extremely deep breaths.
3. Check functioning of emergency bypass.

4. Disconnect breathing tube from regulator and place bottom of tube tightly on palm. Inhale to check seal. Reconnect breathing tube.
5. Take off breathing apparatus and close cylinder valve.
6. Observe both gauges to see if they correspond, and check for air leaks in system.
7. Crack emergency bypass or release air from facepiece and slowly reduce air pressure on regulator gauge to determine that the audible alarm activates at the proper pressure.
8. Check:
  - Condition of straps on harness.
  - Tightness of screws and fasteners on:
    - straps
    - regulator bracket
    - all valve handles.
  - Locking devices on:
    - main line valve
    - cylinder valve
    - carrier to secure cylinder.
  - Holes in diaphragm cap on regulator to see if open.
  - Facepiece:
    - should be clean
    - head band in good condition
    - exhalation valve not sticking or held open
    - inhalation valve not sticking or held open
    - speaking diaphragm and gasket in correctly.
9. Gaskets should be in good condition at:
  - Regulator side of breathing tube.

- Facepiece where breathing tube connects.
  - Speaking diaphragm assembly.
  - O-ring in coupling that connects to cylinder valve.
10. Audible alarm bell cap is tight.
  11. All threads in good condition.
  12. Hydrostatic test data is current.
  13. Cylinder pressure at least 1500 psi, 1800 psi, or 4000 psi, depending on model.
  14. Sanitize facepiece as outlined in OP HS-303, Respirator Inspection, Care, Maintenance, and Storage. Return facepiece to plastic bag.

**NOTE:** If the diaphragm cap is removed to check condition of the diaphragm and level assembly, then this unit must be correctly reassembled to operate properly. If the diaphragm is removed, an operational test of the SCBA must be performed before returning the unit to service.

### **301.5.2 Air-Line Respirators**

The air-line respirator consists of a facepiece to which respirable air is supplied through a small diameter hose. Most units used by W-C will be of the pressure-demand type and include an auxiliary (e.g. 5 minute) tank worn by the worker. The advantages of air-line respirators include the high protection factor, minimal breathing resistance, comfort (compared to SCBA's), long work periods (compared to SCBA's), and the lack of limitations associated with APR cartridges.

The air supplied to air-line systems must meet the Compressed Gas Association requirements for Grade D air. Employees setting up air-line systems using air cylinders should ensure that the cylinders are labeled as breathing quality air. If compressors are used as the air supply source, the compressor

must be located away and upwind from sources of contamination such as engine exhaust and that the compressor is designed for breathing air supply.

The airflow requirements vary with the manufacturer, but generally include a pressure gauge and regulator at the cylinders, with connecting hose pressures less than 125 psi, and a second regulator at the worker, with the pressure dropped further for entry into the facepiece. The maximum length of connecting hose is 300 ft.

The use of air-line respirators requires proper securing of breathing air cylinders, regular observation of tank pressures to ensure an uninterrupted flow to workers, protection of the connecting hoses, specialized training of employees, and inspection of the equipment according to the specific manufacturers directions.

#### **301.6 WARNINGS RELATED TO RESPIRATOR SELECTION AND USE**

1. Failure to properly select the appropriate respirator for all the materials and concentrations to which the respirator wearer may be exposed may result in serious illness, disability, or death of the affected worker.
2. Only self-contained positive pressure breathing apparatus and pressure demand air-line respirators with auxiliary tanks are designed for use in:
  - Oxygen deficient atmospheres (an atmosphere of less than 19.5 percent oxygen by volume at sea level).
  - Poorly ventilated areas, or confined spaces such as tanks, small rooms, tunnels or vessels, unless the confined space is well ventilated and the concentration of toxic contaminants is known to be below the upper limit recommended for the respirator.
  - Atmospheres where the concentrations of toxic contaminants are unknown or are IDLH.

- For fire fighting.
  - At concentrations of substances higher than the upper limits recommended for air purifying respirators.
3. Immediately leave the area and replace the respirator if:
    - Breathing becomes difficult;
    - Dizziness or other distress occurs;
    - You sense irritation, smell or taste the contaminants; and
    - If the respirator becomes damaged.
  4. The respirator selected must properly fit the wearer. Carefully follow the fitting instructions, fit tests, and fit checks contained in the Instruction Booklet that accompanies each respirator to make certain the respirator fits and operates properly (also see OP HS-302, Respirator Fit Testing).
  5. If the worker is exposed to two or more contaminants for which different air-purifying elements are recommended (e.g., ammonia and benzene) and a combination element is not available, then air supplied respirators should be used.
  6. Some toxic contaminants are readily absorbed through the skin. In these cases, appropriate gloves and/or protective clothing may be required to protect other areas of the body that might be exposed to the contaminant.
  7. Respirators should not be used by individuals with beards, or other facial hair, that passes between the sealing flange of the respirator facepiece and the wearer's face. Facial hair may cause leakage or interfere with the proper operation of the respirator exhalation valve, thereby exposing the wearer to the hazardous contaminants.

8. Air-purifying respirators should not be used for sandblasting or for gas or vapor contaminants with poor warning properties.
9. Any air-purifying respirator, when properly selected and fitted, will significantly reduce, but will not completely eliminate, the breathing of contaminant(s) by the respirator wearer. The wearer, when working in atmospheres containing substances such as asbestos (that are reputed to cause cancer in amounts below their TLV) will obtain better protection from a continuous flow or positive pressure air supplied respirator.

### **301.7 SPECIAL RESPIRATOR-USE PROBLEMS**

#### **301.7.1 Facial Hair**

Facial hair lying between the sealing surface of a respirator face piece and the wearer's skin will prevent a good seal. Except with positive pressure air-line respirators, powered air-purifying respirators, and pressure-demand SCBA, a negative pressure exists within the mask upon inhalation; a poor seal will permit contaminated air to enter the facepiece. Even a few days' growth of beard can permit contaminant penetration.

Respirators should not be worn when conditions prevent a good seal of the facepiece to the face. **Facial hair in the form of beards, mustaches, sideburns, and stubble should not be permitted on employees required to wear respirators, if the hair comes between the facepiece sealing surface and the face.**

#### **301.7.2 Corrective Lenses**

Employees wearing corrective eye glasses present a special problem with respect to respiratory protection. Spectacle temple bars, or straps that pass between the sealing surface of a full facepiece respirator and the wearer's face, prevent a good seal and thus must not be worn.

Spectacles with short temple bars that do not interfere with respirator sealing and are taped to the employee's face may be used temporarily. Special corrective lenses or spectacle inserts that can be permanently mounted inside a full facepiece respirator are available from most manufacturers. Such corrective lenses should be mounted in the facepiece such that it ensures good vision and comfort.

Woodward-Clyde

Spectacles or goggles may also interfere with quarter or half-mask sealing; in this case a full facepiece respirator should be employed.

**Contact lenses shall not be worn while wearing a respirator in a contaminated atmosphere.** Contaminants may get into the eyes and cause severe irritation and/or discomfort with quarter or half-masks. Full facepieces can pull at the side of the eye and pop out the lens.

### **301.7.3 Cold Weather Use of Respirator**

Under cold weather conditions a number of problems can develop, such as fogging of full facepiece respirators, valve sticking and rubber stiffness that prevents good facial seal.

Fogging of full facepiece respirators can be eliminated easily by installing a nose-cup into the facepiece. This device, available from most manufacturers, deflects the exhalation breath away from the cold facepiece lens. Defogging solution should also be used.

Other cold weather problems should be discussed with the respirator manufacturer.

### **301.7.4 Voice Communication**

Under some conditions it is necessary for respirator wearers to communicate with other personnel within or outside the contaminated area. When this is necessary, special communicating equipment, generally available from the respirator manufacturer, can be installed inside the facepiece. If penetration of the facepiece or altering of the respirator is in any way necessary to install communications equipment, check with the respirator manufacturer to be sure that the NIOSH/MSHA approval will not be voided by the installation.

## **301.8 POWERED AIR-PURIFYING RESPIRATORS**

Powered air-purifying respirators protect against particulates and/or gases and vapors. The great advantage of the powered air-purifying respirator is that it usually supplies air at a positive pressure so that any leakage is outward from the facepiece. It may be used with a helmet, hood or facepiece. Air



can be supplied by a user mounted, battery powered backpack purifier, or by a stationary pump through up to 25 feet of low pressure hose. It has good applicability to abrasive blasting, grinding, pesticide spraying and operations using asbestos.

Generally, powered air-purifying units can be used up to 25 times the PEL for dusts, mists, and fumes, when used with filters that are approved for materials with PELs not less than  $0.05 \text{ mg/m}^3$  or 2 mppcf and nuisance dusts. Such respirators can be used up to 25 times the PEL when used with high efficiency filters. For use in chemical vapor or gaseous atmospheres, the MUC depends on the chemical cartridge or canister used. In all cases check the manufacturer's specifications and the NIOSH/MSHA approval for the particular configuration used. Consideration should first be given to standard air-purifying units, supplied air devices and SCBAs.

### **301.9 DISPOSABLE RESPIRATORY PROTECTION EQUIPMENT**

The use of disposable respiratory protection devices eliminates the need to clean, disinfect, inspect and repair equipment. Since the cleaning and maintenance aspects of a respiratory protection program can require time and dollar expenditures, the use of equipment not requiring such services may be desirable in some instances. While the cost of disposable equipment may, in some cases, be higher than comparable reusable devices, this cost may be offset or recoverable by the savings of labor and capital investments for cleaning and inspection facilities.

Disposable chemical vapor or gas respirators might be used economically where limited numbers of this type of respirator are in use or where specific operations are performed infrequently.

### 301.10 REFERENCES

American Conference of Governmental Industrial Hygienists, TLVs, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices Environment 1992-93, ACGIH, 6500 Glenway Avenue, Building D-5, Cincinnati, Ohio 45211-4438.

Respiratory Protection, A Manual and Guideline, American Industrial Hygiene Association, 1991.

American National Standard, Practices for Respiratory Protection ANSI Z88.2-1980, American National Standards Institute, 1430 Broadway, New York, New York 10018.

National Institute for Occupational Safety and Health, A Guide to Industrial Respiratory Protection, DHHS (NIOSH) Publication 87-116, September 1987, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

National Institute for Occupational Safety and Health, Occupational Health Guidelines for Chemical Hazards, DHHS (NIOSH) Publication No. 81-123, January 1981, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

NIOSH/OSHA Pocket Guide to Chemical Hazards, U.S. DHHS (NIOSH), Publication No. 90-117, June 1990.

U.S. Department of Labor, OSHA Safety and Health Standards for General Industry (Title 29 CFR Part 1910), Respiratory Protection 1910.134, U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, N.W., Washington, DC 20210.

TABLE 301-1

**NIOSH RECOMMENDED MAXIMUM USE CONCENTRATIONS  
(EXPRESSED IN PPM)  
FOR GAS AND VAPOR AIR-PURIFYING ELEMENTS**

Classification of gas and vapor air-purifying elements			
Type of gas or vapor	Cartridge(s)	Chin-style canister	Front- or back-mounted canister
Organic vapors	1,000*	5,000†	20,000†
Acid gases			
Sulfur dioxide (SO <sub>2</sub> )	50	100	100
Chlorine (Cl <sub>2</sub> )	10	25	25
Hydrochloric (HCl)	50	100	100
Ammonia (NH <sub>3</sub> )	300	500	500
Methyl amine (CH <sub>3</sub> NH <sub>2</sub> )	100	--	--
Carbon monoxide (CO)	NA	NA	1,500

\* Maximum use concentration will be 1,000 ppm or the immediately dangerous to life or health (IDLH) value for the specific organic vapor, whichever is lower.

† Maximum use concentration for "entry into" will be limited to the value listed or to the IDLH value for the specific organic vapor, whichever is lower.

## OPERATING PROCEDURE NO. HS-302

### 302.0 RESPIRATOR FIT TESTING

#### 302.1 PURPOSE

The purpose of this Operating Procedure is to identify and to establish respirator fit testing requirements and procedures.

#### 302.2 REQUIREMENTS

In compliance with Occupational Safety and Health Administration (OSHA) regulation Title 29 Code of Federal Regulations (CFR) 1910.134, all Woodward-Clyde (W-C) employees whose job assignments require use of non-powered air-purifying respirators (APR) or air-supplied respirators (ASR) that operate in the demand mode, must be fit tested using the isoamyl acetate (IAA) and/or the irritant smoke (IS) test. Fit tests shall be performed to identify the brand and size of respirator that fits each employee and to facilitate final fitting adjustments in the field.

Fit tests must be recorded for each tested employee. The record shall include test dates and identify the brands, models, and sizes of respirators tested.

#### 302.3 ISOAMYL ACETATE TEST

##### 302.3.1 Isoamyl Acetate Test Equipment

- Isoamyl acetate (USP grade in bottles or in ampules).
- Two bottles for odor recognition testing.
- Test enclosure. A simple test enclosure can be constructed by cutting a small slit at the center of the closed end of a clear plastic bag and inserting the hook of a wire clothes hanger through the slit so that the bag will hang open side down. The bag should be at least 3 mil thick and approximately the size of a garbage bag (large size).

### 302.3.2 Isoamyl Acetate Testing Procedures

1. The subject must exhibit his/her ability to recognize the odor of IAA. One bottle shall contain water and another, a solution of IAA and water. The subject must be able to discern which bottle contains the IAA solution, thus verifying his/her ability to recognize the odor.
2. The wearer puts on the respirator and adjusts the facepiece and head straps to achieve a snug, but comfortable fit. The positive-negative pressure test (see Section 302.6) should be applied at this point. If the respirator is the air-purifying type, it must be equipped with a fresh cartridge(s) or canister designed to protect against organic vapors.
3. The wearer is exposed to IAA by entering a test enclosure containing IAA vapors. The wearer is exposed first while holding his/her head still. If the wearer does not smell IAA, he/she is exposed again while performing the activities listed in Section 302.5.
4. If the wearer does not smell IAA while active and inactive, a satisfactory fit can be assumed; however, if the wearer smells IAA, he/she readjusts the facepiece and/or headstraps, and Step 2 is repeated.
5. If the wearer continues to smell IAA, an attempt is made to locate the leakage point. If the leakage point cannot be found or corrected, another respirator of the same brand and size is tried. If the respirator leaks, a respirator of another size or brand is tried.

### 302.4 IRRITANT SMOKE TEST

1. The wearer puts on the respirator and adjusts facepiece and head straps to achieve a snug, but comfortable fit. The positive-negative pressure test (see Section 302.6) should be applied at this point. If the respirator is the air-purifying type, it must be equipped with a HEPA (high efficiency) filter(s).

2. The wearer stands with his/her back towards a fume hood or other ventilation source and is asked to keep his/her eyes closed during the test. (Note: eyes must be closed even when full-face respirators are tested.)
3. With the wearer holding his/her head still, the tester lightly puffs smoke over the facepiece, holding the tube at least 2 feet from it. The volume of smoke should be kept minimal and the wearer's reaction observed between puffs.
4. If the wearer detects no leakage, the tester increases smoke density and moves the tube progressively closer to the wearer, but no closer than 6 inches. If no leakage is detected, exposure is continued while the wearer performs the activities listed in Section 302.5.
5. If no leakage is detected with and without head movements, a satisfactory fit can be assumed. However, if leakage is detected, smoke generation should be stopped and Steps 3 and 4 repeated after the wearer readjusts the facepiece and/or head straps.
6. If a respirator under test continues to leak, another respirator of the same brand, model, and size should be tried. If it does not pass the test, another size or another brand should be tried.

### 302.5 ACTIVITIES

If, during the IAA or IS test, no leakage occurs while the wearer is holding his/her head still, the test shall be continued while the wearer is instructed to perform the following activities:

1. Deep breathing as in heavy exertion. This activity should not be done long enough to cause hyperventilation.
2. Side-to-side, then up-and-down head movements (exaggerated).
3. Read the "Rainbow Passage." Must be loud enough to be heard by someone standing nearby.

### **302.6 POSITIVE-NEGATIVE PRESSURE TESTS**

These tests can be performed by the wearer alone and requires no special equipment. The tests should be performed only on respirators that have passed the IAA or IS tests and for preliminary fitting during the IAA and IS tests.

In the positive pressure test, the wearer closes off the exhalation valve of the respirator by gently placing his/her palm over the valve and gently exhaling into the facepiece. The fit is considered satisfactory if a slight pressure builds up in the facepiece without any evidence of outward leakage.

In the negative pressure test, the wearer closes off the inlet of the canister, cartridge(s) or filter(s) with his/her palm or of the breathing tube of a SA respirator by squeezing the tube and inhaling gently so that the facepiece collapses slightly. Breath is held for about 10 seconds. If the facepiece remains slightly collapsed and no inward leakage is detected during the 10-second period, fit may be considered satisfactory.

### **302.7 TEST FREQUENCY**

An IAA and/or IS test must be performed whenever an employee is provided: (1) a respirator for the first time and (2) a replacement respirator of a different brand, model, or size. A test must also be performed whenever: (1) medical records indicate that an employee may have been exposed despite wearing a respirator and (2) an employee complains of having a faulty respirator.

### **302.8 DOCUMENTATION**

Respirator fit-test records must be maintained. Form HS-302 should be used to document the results of each fit test. It should be signed by the individual being tested and also the person administering the test.

HS-302  
WOODWARD-CLYDE  
HEALTH AND SAFETY TRAINING  
RESPIRATOR FIT TEST RECORD

Name: \_\_\_\_\_

Social Security No: \_\_\_\_\_

Company/Office: \_\_\_\_\_

Last Medical Exam: \_\_\_\_\_

Fit Test Date: \_\_\_\_\_

Corrective Lenses Needed: Yes ☐ No ☐

Briefed on fundamental principles of respiratory protection, use, selection, inspection cleaning, maintenance and storage of equipment.

Yes ☐ No ☐

Isoamyl acetate odor recognition

Yes ☐ No ☐

	<u>RESPIRATOR 1</u>	<u>RESPIRATOR 2</u>	<u>RESPIRATOR 3</u>
Equipment Type	_____	_____	_____
Manufacturer's Name	_____	_____	_____
Model	_____	_____	_____
Size	_____	_____	_____
Facepiece Composition (Rubber Silicone)	_____	_____	_____

<u>TEST PERFORMED</u>	<u>RESPIRATOR 1</u>	<u>RESPIRATOR 2</u>	<u>RESPIRATOR 3</u>
Negative Pressure Test:	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>
Positive Pressure Test:	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>
Isoamyl Acetate Vapor Test:	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>
Irritant Smoke Test:	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>	P <input type="checkbox"/> F <input type="checkbox"/>

The individual named above has been fit-tested according to procedures specified in Woodward-Clyde's Operating Procedure HS-302. This qualitative fit test protocol has been adapted from OSHA 29 CFR 1910 and 29 CFR 1926.

Examiner's Name (Please Print) \_\_\_\_\_

Examiner's Signature \_\_\_\_\_

Date \_\_\_\_\_

Employee's Signature \_\_\_\_\_

Date \_\_\_\_\_



## OPERATING PROCEDURE NO. HS-303

### 303.0 RESPIRATOR INSPECTION, CARE, MAINTENANCE, AND STORAGE

#### 303.1 PURPOSE

The purpose of this Operating Procedure (OP) is to provide guidance on the proper care and use of respiratory protective devices, and to assist in adequately protecting personnel as well as complying with Occupational Safety and Health Administration (OSHA) respiratory protection standard Title 29 Code of Federal Regulations (CFR) 1910.134. Guidance in the selection of respiratory devices is provided in OP HS-301.

#### 303.2 APPLICABILITY

This procedure is applicable for use in caring for half-face and full-face respirators of either air-purifying or air-supplying type. Proper care of respirators is essential for their satisfactory performance. Of importance is respirator inspection, care, maintenance, and storage.

#### 303.3 REQUIREMENTS

OSHA requires, as part of an inspection program, that all respirators be leak checked, a determination that the complete assembly is gas tight. Follow field inspection procedures to examine the freshly cleaned, reassembled respirator.

"Cleaning and Disinfecting" - OSHA 1910.134 states "routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to ensure that proper protection is provided..." and that emergency use respirators "shall be cleaned and disinfected after each use."

The OSHA standard states that "replacement or repair shall be done by experienced persons with parts designed for the respirators." Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval (i.e.,

National Institute for Occupational Safety and Health (NIOSH), Mine Safety and Health Administration (MSHA)) of the device.

OSHA requires that respirators be stored to protect against:

- Dust;
- Sunlight;
- Heat;
- Extreme cold;
- Excessive moisture;
- Damaging chemicals; and
- Mechanical damage.

The OSHA standard suggests that respirators be in their original cartons, however, this may provide only minimal protection from mechanical damage.

### 303.4 INSPECTION

#### 303.4.1 Air-Purifying Respirators

Routinely used air-purifying respirators should be checked as follows before and after each use:

1. Examine the facepiece for:
  - Excessive dirt;
  - Cracks, tears, holes or physical distortion of shape from improper storage;
  - Inflexibility of rubber facepiece (stretch and knead to restore flexibility);
  - Cracked or badly scratched lenses in full facepieces;
  - Incorrectly mounted full facepiece lenses, or broken or missing mounting clips; and

- Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s), if required.
2. Examine the head straps or head harness for:
    - Breaks;
    - Loss of elasticity;
    - Broken or malfunctioning buckles and attachments; and
    - Excessively worn serrations on head harness, that might permit slippage (full facepieces only).
  3. Examine the exhalation valve for the following after removing its cover:
    - Foreign material, such as detergent residue, dust particles or human hair under the valve seat;
    - Cracks, tears or distortion in the valve material;
    - Improper insertion of the valve body in the facepiece;
    - Cracks, breaks, or chips in the valve body, particularly in the sealing surface;
    - Missing or defective valve cover; and
    - Improper installation of the valve in the valve body.
  4. Examine the air-purifying element for:
    - Incorrect cartridge, canister or filter for the hazard;
    - Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder;
    - Expired shelf-life date on the cartridge or canister; and
    - Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc., over the inlet.
  5. If the device has a corrugated breathing tube, examine it for:
    - Broken or missing end connectors;

- Missing or loose hose clamps; and
  - Deterioration, determined by stretching the tube and looking for cracks.
6. Examine the harness of a front-or back-mounted gas mask for:
- Damage or wear to the canister holder, that may prevent its being held in place; and
  - Broken harness straps for fastening.

#### **303.4.2 Atmosphere-Supplying Respirators**

For a routinely used atmosphere-supplying device, use the following procedures:

1. If the device is a tight-fitting facepiece, use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.
2. If the device is a hood, helmet, blouse or full suit, use the following procedures:
  - Examine the hood, blouse or full suit for rips and tears, seam integrity, etc.;
  - Examine the protective headgear, if required, for general condition with emphasis on the suspension inside the headgear;
  - Examine the protective face shield, if any, for cracks or breaks or impaired vision; and
  - Make sure the protective screen is intact and secured correctly over the face shield.

3. Examine the air-supply systems for:

- Integrity and good condition of air-supply lines and hoses, including attachment and end fittings; and
- Correct operation and condition of all regulators, or other air flow regulators.

In addition to the above, for self-contained breathing apparatus (SCBA) units also determine that:

1. The high pressure cylinder of compressed air is sufficiently charged for the intended use, preferably fully charged.
2. On closed-circuit SCBA, a fresh canister of CO<sub>2</sub> (carbon dioxide) sorbent is installed.
3. On open-circuit SCBA, the cylinder has been recharged if less than 25 percent of the useful service time remains.

All SCBAs are required to have a warning device that indicates when the 25 percent level is reached. However, it is recommended that an open-circuit SCBA be fully charged before use.

The specific inspecting procedures for the brand of air-line or SCBA equipment should be followed.

### **303.4.3 Respirator Disassembly**

The used respirators should be collected and deposited in a central location. They are taken to an area where the filters, cartridges or canisters are removed and discarded. Canisters should be damaged or marked to prevent accidental reuse. If facepieces are equipped with reusable dust filters, they may be cleaned with compressed air in a hood. This prevents dust from getting into the room and affecting the respirator personnel. If

SCBA are used, tanks are removed and connected to an area where the SCBA regulators and low-air warning devices are tested. SCBA facepieces are cleaned like air-purifying respirator facepieces.

#### **303.4.4 Defects Found in Field Inspection**

If defects are found during any field inspection, two remedies are possible. If the defect is minor, repair and/or adjustment may be made on the spot. If it is major, the device should be removed from service until it can be repaired. A spare unit should replace the unit removed from service. **Under no circumstances should a device that is known to be defective remain in the field.**

#### **303.4.5 Inspection During Cleaning**

Because respirator cleaning usually involves some disassembly, it presents a good opportunity to examine each respirator thoroughly. The procedures outlined above for a field inspection should be used. Respirators should be inspected after cleaning operations and reassembly have been accomplished.

### **303.5 RESPIRATOR CARE**

When used routinely, respirators should be exchanged daily for cleaning and inspection. Where respirators are used only occasionally, the exchange period could be weekly or monthly. Workers maintaining their own respirators should be thoroughly briefed on cleaning and disinfecting them. Although workers may not be required to maintain their own respirators, briefing on the cleaning procedure will encourage their acceptance of a respirator by providing knowledge of a clean, disinfected, properly maintained device. This is particularly important where respirators are not individually assigned.

Where respirators are individually assigned (a practice to be encouraged), they should be identified to ensure that the worker always receives the same device. Identification markers must not penetrate the facepiece, block the filter, cartridge parts or exhaust valves.

When a relatively small number of respirators are used, or where workers clean their own respirators, the generally accepted procedure is washing with detergent and warm water using a brush, thoroughly rinsing in clean water, and drying in a clean place. Precautions should be taken to prevent damage from rough handling during this procedure.

When large numbers of respirators are used, it is recommended that centralized cleaning and maintenance be performed and that specialized equipment and personnel trained in respirator maintenance be utilized.

### **303.5.1      Cleaning and Sanitizing**

The actual cleaning may be done in a variety of ways. A commercial dishwasher can be used. A standard domestic clothes washer may also be used if a rack is installed around the agitator to hold the facepieces in fixed positions. If the facepieces are placed loosely in the washer, the agitator may damage them. A standard domestic dishwasher may be used, but it is not preferred because it does not immerse the facepieces. Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Disinfection is not absolutely necessary if the respirator is reused by the same person. However, where individual issue is not practical, disinfection is strongly recommended. Reliable, effective disinfectants may be made from readily available household solutions, including:

1.     Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Chlorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.
2.     Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

If the respirators are washed by hand, a separate disinfecting rinse may be provided. If a washing machine or dishwasher is used, the disinfectant must be added to the rinse cycle;

the amount of water in the machine at that time will have to be measured to determine the correct amount of disinfectant.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F, but it should not be less than 120°F to ensure adequate cleaning. In addition, if commercial or domestic dishwashers are used, the drying cycle should be eliminated, since the temperatures reached in these cycles may damage the respirators.

### **303.5.2 Rinsing**

The cleaned and disinfected respirators should be rinsed thoroughly in water (140°F maximum) to remove all traces of detergent and disinfectants. This is very important for preventing dermatitis.

### **303.5.3 Drying**

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces. Another method is to equip a standard steel storage cabinet with an electric heater that has a built-in circulating fan, and to replace the solid steel shelves with steel mesh.

### **303.5.4 Reassembly and Inspection**

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.



### 303.6 MAINTENANCE AND REPAIR

Maintenance personnel must be thoroughly trained. They must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

These restrictions apply primarily to maintenance of the more complicated devices, especially closed- and open-circuit SCBAs, and more specifically, regulator valves and low pressures warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. There should be no major problems in repairing and maintaining most respirators, particularly the commonly used air-purifying type.

An important aspect of any maintenance program is having enough spare parts on hand. Only continual surveillance of replacement rates will determine what parts and quantities should be kept in stock. It is desirable to have a recording system to indicate spare parts usage and the inventory on hand.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

### 303.7 RESPIRATOR STORAGE

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt. Freshly cleaned respirators should be placed in heat-sealed, ziplock, or other reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set."

Air-purifying respirators kept ready for non-routine or emergency use should be stored in a cabinet with individual compartments. The storage cabinet should be readily accessible, and all workers should be made aware of its location, as is done for fire extinguishers.

Preventing serious injury from the inhalation of a toxic substance depends entirely on how quickly workers can get to the emergency respirators.

A chest or wall-mounted case may be used for storing SCBAs for use in emergencies. Again, the location of SCBAs should be well-known and clearly marked. Unlike fire extinguishers, however, they should be located in an area that will predictably remain uncontaminated. Putting on a SCBA in a highly contaminated atmosphere, as might be created by massive release of a toxic material, may take too long a time to perform safely in that area. Therefore, the first reaction should be to escape to an uncontaminated area, then put on the SCBA, that should be located there, and re-enter the hazardous area for whatever task must be done. Exceptions to this rule may be encountered, and only a thorough evaluation of the process and escape routes will permit a final decision about the correct storage location for SCBAs. Respirators should be stored in a plastic bag inside a rigid container.

Workers who are adequately trained should develop a respect for respirators that will be an automatic incentive to protect respirators from damage. Besides providing better assurance of adequate protection, this training will lower maintenance costs by decreasing damage.

### 303.8 RECORDKEEPING

Records should be maintained to document that proper care and maintenance has been performed on respiratory protection devices. Records should indicate when and what was done to each respirator, and also by whom.

### 303.9 REFERENCES

U.S. Department of Labor, OSHA, Safety and Health for General Industry (Title 29 CFR Part 1910), Respiratory Protection 1910.134, U.S. Department of Labor Occupational Safety and Health Administration.

American National Standard, Practices for Respiratory Protection, ANSI Z88.2-1980, American National Standards Institute.

Birkner, L.R., Respiratory Protection A Manual and Guideline, American Industrial Hygiene Association, 1991.



## **OPERATING PROCEDURE NO. HS-503**

### **503.0 EMERGENCY PROCEDURES**

#### **503.1 PURPOSE**

The purpose of this Operating Procedure is to provide guidance in preparing for contingency or emergency situations during field activities. Accidents can and do happen. However, with adequate planning and preparedness resulting consequence can be minimized or prevented.

Emergency preparedness starts with advanced planning. It requires anticipation of potential problems or hazards. Proper emergency preparedness involves use of the project health and safety plan that may address emergency situations. It involves training, site orientation of personnel, medical information of personnel, and availability of emergency equipment and services.

#### **503.2 TYPES OF EMERGENCIES**

There are three major categories of emergencies that can occur during hazardous waste site investigations. They are medical emergencies, accidents, and safety equipment problems.

##### **503.2.1 Medical Emergencies**

Medical emergencies can be described as situations that present a significant threat to the health of personnel involved in site investigations. These can result from chemical exposures, heat stress, cold stress, and poisonous insect or snake bites. Medical emergencies must be dealt with immediately and proper care should be administered. This may be in the form of first aid and emergency hospitalization.

##### **503.2.2 Accidents**

Accidents can result from physical hazards on a site. These hazards can include tripping, catching, cutting, and may be associated with debris on a site or heavy equipment used in the investigation. Accidents may include:

- Broken bones;
- Burns;
- Sprains;
- Puncture wounds;
- Electrical shock; and
- Cuts by contaminated materials.

Appropriate medical attention must be provided to individuals involved in site investigations who have suffered an accident.

#### **503.2.3 Safety Equipment Problems**

A source of emergency may develop due to malfunction or other problem associated with safety equipment being utilized by investigative personnel. These types of problems may or may not result in emergency situations. However, safety equipment problems must be corrected before proceeding with field investigative activities. Safety problems may include:

- Leaks or tears in protective clothing;
- Failure of respiratory protective devices (SCBA, air-purifying respirators); and
- Encountering contaminants for which prescribed protective equipment may not be suitable.

#### **503.3 ADVANCE PLANNING**

Advance planning should be practiced and include assessments of potential hazards or problems that may be encountered. Emergency preparedness should be addressed in the site safety plan. It should consider:

- Hazard evaluation;
- Emergency precautions;
- Hospital/poison control centers (telephone numbers);
- Emergency transportation systems (fire, police, ambulance);
- Emergency routes (maps, dry runs); and
- Escape routes:
  - On-site escape (rapid evacuation to safe area)
  - Off-site escape (best means of evacuation from site).

#### **503.4 TRAINING**

Investigative teams should include personnel with training in first aid and CPR. Personnel should become familiar with site area, available equipment, and emergency services available.

#### **503.5 MEDICAL SURVEILLANCE INFORMATION**

Personnel should be aware of any special medical problems of individual team members. This may include allergies, insect stings, poison plants, penicillin, etc.

#### **503.6 EMERGENCY EQUIPMENT**

Provisions should be made to have appropriate emergency equipment available and in proper working condition. This equipment may include:

- First aid kits;
- Eye wash kits - fill and pressurize;
- Fire extinguisher;
- Emergency oxygen;

- Splints;
- Stretcher;
- Blankets; and
- Life vests.

Equipment should be checked before commencing site investigation activities, and defective equipment repaired or replaced before performing site investigation. Provisions should be made for redundant or back-up safety equipment.

### **503.7 SAFETY PRACTICES**

The following safety practices should be utilized to prevent or deal with emergency situations:

1. A continuous line-of-sight should be maintained between work party downrange and personnel at the command post. Personnel stationed beyond the command post, in order to maintain the line-of-sight with the work party, must be outfitted with appropriate protective equipment.
2. Person should be dressed to same degree as the work party in order to provide an extra man for any needed rescue effort.
3. Communications should be maintained and work party must have system for rapid and clear distress call back to command post.
4. Check to insure that all preplanning information is correct.
5. Maintain thorough knowledge of expected weather conditions. Avoid working in wet weather, electrical storms, extremely hot conditions, or extremely cold conditions.
6. Thoroughly understand tasks to be performed.
7. Thoroughly brief all team members on all aspects of the tasks.



### 503.8 DOCUMENTATION

Records should be maintained with regard to emergency situations. Incident/Accident Reports should be filed in the event of an incident or accident (see OP HS-102).



## **OPERATING PROCEDURE NO. HS-211**

### **211.0 BLOODBORNE PATHOGENS**

#### **211.1 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN**

The following Exposure Control Plan has been developed in accordance with the Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Standard, Title 29 Code of Federal Regulations (CFR) 1910.1030. The goal is to reduce the risk of disease in employees potentially exposed to bloodborne pathogens.

#### **211.2 EXPOSURE ROUTES**

The transmission of infectious agents such as bacteria and virus's may occur through direct contact, airborne, and vector routes of exposure. Direct contact is an important route of exposure for bloodborne pathogens due to needlestick injuries, puncture injuries, contact with abraded skin, or contact with areas such as the eyes, without skin protection. While very few organisms can enter the body through normal intact skin, direct contact with blood is to be avoided.

The airborne route of exposure is significant for common viral diseases including colds, flu, mumps, and chicken pox, but is not typically an exposure route for pathogens such as Human Immunodeficiency Virus (HIV) or Hepatitis B Virus (HBV) infections.

Vector borne diseases are those transferred to humans by insects or animals and include lyme disease, malaria, plague, and rabies. (Further information on tick-borne diseases may be seen in HS-213.) Vectors are not considered a significant route of exposure for HIV or HBV.

Woodward-Clyde (W-C) employees that may have potential exposure to blood or to biohazard waste include Site Safety Officers (SSO) during first aid procedures and field staff on projects involving medical or other infectious waste. The W-C job classification and associated tasks for these categories are as follows:

<u>Job Classification</u>	<u>Task Procedures/Description</u>
Site Health and Safety Officer (SSO)	Enforcement of the Site Health and Safety Plan during field activities and First Aid
Field Staff	Field projects involving potential exposure to medical or other infectious waste as defined by the Site Health and Safety Plan

### **211.3 IMPLEMENTATION SCHEDULE AND METHODOLOGY**

W-C will incorporate this Operating Procedure when first-aid capability is provided by W-C or when field work involves medical or infectious waste. More detailed procedures, if needed, will be incorporated into a site specific safety and health plan.

### **211.4 COMPLIANCE METHODS**

Universal precautions will be observed at all work site locations in order to prevent contact with blood or other potentially infectious materials. All blood or other potentially infectious material will be considered infectious regardless of the perceived status of the source individual.

Engineering and work practice controls will be utilized to eliminate or minimize exposure to employees at all work site locations. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be utilized. At all work site locations the following procedures will be utilized:

- Separate containers for used first aid equipment
- Flush skin areas where cuts or abrasions have occurred before adding band aids or clean wrappings
- Gloves to be worn by those administering first aid

- Handwashing after administering first aid
- Removal of blood contaminated clothing
- Clean-up of blood on tools or equipment

The controls will be checked and maintained on a regular schedule. The schedule for reviewing the effectiveness of the controls is as follows:

- Controls and procedures will be checked daily before start of any field activities.
- Maintaining and enforcing these controls will be the responsibility of the Site Health and Safety Officer.

Handwashing facilities must be readily accessible after incurring exposure. If handwashing facilities are not feasible, the SSO is required to provide either an antiseptic cleanser in conjunction with a clean cloth/paper towels or antiseptic towelettes. If these alternatives are used, then the hands are to be washed with soap and running water as soon as feasible.

If employees incur exposure to their skin or mucous membranes then those areas shall be washed or flushed with water, as appropriate, as soon as feasible following contact.

## **211.5 CONTAINERS**

Contaminated cutting materials, (i.e., knife, scissors) that are re-usable are to be placed immediately, or as soon as possible after use, into a separate container. These containers must be puncture resistant, labeled with a biohazard label, and be leakproof.

Containers for biohazard waste (used bandages, used gloves, etc.) will be located in the same area as the first aid equipment, and will be the responsibility of the SSO for proper disposal. Disposal will be

arranged as soon as possible after use. These containers must be labeled with a biohazard label, and be leakproof

#### **211.6 WORK AREA RESTRICTIONS**

Workers are not to eat, drink, or smoke in areas with potential exposure to infectious materials.

All procedures will be conducted in a manner which will minimize splashing, spraying, splattering, and generation of droplets of blood or other potentially infectious materials. To help accomplish this, first aid personnel will not apply their unprotected hands to any patient body areas where blood is present.

#### **211.7 SPECIMENS**

Certain W-C worksites require the collection of blood or urine specimens for worker monitoring. Specimens will be placed in a container which prevents leakage during the collection, handling, processing, storage, and transport of the specimens. The container used for this purpose will be labeled or color coded with correct information.

If outside contamination of the primary container occurs, the primary container shall be placed within a secondary container which prevents leakage during the handling, processing, storage, transport, or shipping.

#### **211.8 CONTAMINATED EQUIPMENT**

Equipment which has become contaminated with blood or other potentially infectious materials shall be decontaminated as necessary unless the decontamination of the equipment is not feasible. This decontamination will be kept separate from any other on-site decontamination. Items contaminated with blood and also possible chemical contamination shall be placed in a container and labeled with its suspected contaminants, including the blood. Further instructions for disposal will be obtained from the Health and Safety Officer (HSO).

## 211.9 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment will be chosen based on the anticipated exposure to blood or other potentially infectious materials. The protective equipment will be considered appropriate only if it does not permit blood or other potentially infectious materials to pass through or reach the employees' clothing, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used. This PPE will be stored or placed with all first aid equipment or kits.

All personal protective equipment will be cleaned, laundered, and disposed of by the employer at no cost to employees.

Any clothing which is penetrated by blood shall be removed immediately or as soon as feasible. PPE will be removed prior to leaving the work area.

Gloves shall be worn where it is reasonably anticipated that employees will have had contact with blood or other potentially infectious materials. Gloves will be available from the first aid kit.

Disposable gloves used during first aid and/or emergency procedures are not to be washed or decontaminated for re-use and are to be replaced as soon as practical when they become contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised. Utility gloves may be decontaminated for re-use provided that the integrity of the glove is not compromised. Utility gloves will be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.

Respirators in combination with eye protection devices, such as goggles or glasses with solid side shield, or chin length face shields, are required to be worn whenever splashes, spray, splatter, or droplets of blood or other potentially infectious materials may be generated.

Tyvek coverall (coated or uncoated), should be worn if the potential exists for blood to splash onto the first aid responders clothing.

Woodward-Clyde

Revised: 10/93

HS-211-5

Any PPE, soil, or small equipment that has blood on it shall be placed in a lined container and labeled. The SSO shall contact the HSO for further disposal information.

#### **211.10 LAUNDRY PROCEDURES**

Laundry contaminated with blood or other potentially infectious materials will be handled as little as possible. Such laundry will be placed in appropriately marked bags at the location where it was used. The HSO will then be notified for further instructions.

All employees who handle contaminated laundry will utilize personal protective equipment to prevent contact with blood or other potentially infectious materials.

If the laundry is being sent off-site, then the laundry service accepting the laundry is to be notified.

#### **211.11 HEPATITIS B VACCINE**

All employees who have been identified as having exposure to blood or other potentially infectious materials, or are involved with any on-site first aid case, will be offered the Hepatitis B vaccine, at no cost to the employee. The vaccine is not necessary if the employee has previously had the vaccine. The employee can request antibody testing which will show if the employee has sufficient immunity.

Employees who decline the Hepatitis B vaccine will sign a waiver which uses the wording in Form HS 211-1

Employees who initially decline the vaccine but who later wish to be immunized may do so at no cost. The HSO of each office has the responsibility for assuring that the vaccine is offered, the waivers are signed, and the policy is enforced.

#### **211.12 POST-EXPOSURE EVALUATION AND FOLLOW-UP**

When the employee incurs an exposure incident, it should be reported to the HSO using W-C incident report HS-102.



All employees who incur an exposure incident will be offered post-exposure evaluation and follow-up.

This follow-up will include the following:

- Documentation of the route of exposure and the circumstances related to the incident.
- If possible, the identification of the source individual and, if possible, the status of the source individual. The blood of the source individual will be tested (after consent is obtained) for HIV/HBV infectivity.
- Results of testing of the source individual will be made available to the exposed employee with the exposed employee informed about the applicable laws and regulations concerning disclosure of the identity and infectivity of the source individual.
- The employee will be offered the option of having their blood collected for testing of the employee's HIV/HBV serological status. The blood sample will be preserved for up to 90 days to allow the employee to decide if the blood should be tested for HIV serological status. However, if the employee decides prior to that time that testing will or will not be conducted then the appropriate action can be taken and the blood sample discarded.
- The employee will be offered post-exposure prophylaxis in accordance with the current recommendations of the U.S. Public Health Service.
- The employee will be given appropriate counseling concerning precautions to take during the period after the exposure incident. The employee will also be given information on what potential illnesses to be alert for and to report any related experiences to appropriate personnel.
- The HSO has been designated to assure that the policy outlined here is effectively carried out as well as to maintain records related to this policy.

### **211.13 INTERACTION WITH HEALTH CARE PROFESSIONALS**

A written opinion shall be obtained from the health care professional who evaluates employees for each W-C office. Written opinions will be obtained in the following instances:

- 1) When the employee is sent to obtain the Hepatitis B vaccine.
- 2) Whenever the employee is sent to a health care professional following an exposure incident.

Health care professionals shall be asked:

- 1) Whether the Hepatitis B vaccine is indicated and if the employee has received the vaccine, or for evaluation following an incident.
- 2) That the employee has been informed of the results of the evaluation
- 3) That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials.

### **211.14 TRAINING**

Training for all employees will be conducted prior to initial assignment to tasks where occupational exposure may occur. Training for employees will include the following:

- 1) The OSHA standard for Bloodborne Pathogens
- 2) Epidemiology and symptomatology of bloodborne diseases
- 3) Modes of transmission of bloodborne pathogens
- 4) The exposure Control Plan, i.e., points of the plan, lines of responsibility, how the Plan will be implemented, etc.

- 5) Procedures which might cause exposure to blood or other potentially infectious materials while performing first aid.
- 6) Control methods which will be used at the facility to control exposure to blood or other potentially infectious materials
- 7) Personal protective equipment available on-sites
- 8) Post-exposure evaluation and follow-up
- 9) Signs and labels used on-site
- 10) Hepatitis B vaccine program for W-C

The HSO is responsible for providing the training for their office.

#### **211.15 RECORDKEEPING**

All records required by the OSHA standard will be maintained by the HSO.

All employees will receive refresher training every 12 months. (Note that this training is to be conducted within one year of the employee's previous training.)

The outline for the training material is located in each office and also with the WCGI Health and Safety Office in Philadelphia, Pennsylvania.

FORM HS 211-1

TO SECTION 1910.1030  
HEPATITIS B VACCINE DECLINATION (MANDATORY)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Name: \_\_\_\_\_  
Employee Signature Date

Print: \_\_\_\_\_  
Employee Name

Name: \_\_\_\_\_  
Health and Safety Officer Signature Date

Print: \_\_\_\_\_  
Health and Safety Officer Name



**APPENDIX C  
FINAL REPORT**

**DRUM MANAGEMENT PLAN**

**ALBION SHERIDAN TOWNSHIP  
LANDFILL  
CALHOUN COUNTY, MI**

*Prepared for*  
Cooper Industries  
Houston Texas

and

Corning, Inc.  
Corning, New York

August, 1997

**Woodward-Clyde** 

38777 West Six Mile Road  
Suite 200  
Livonia, Michigan 48151  
6E13045

# TABLE OF CONTENTS

---

<b>Section 1</b>	<b>Introduction .....</b>	<b>1-1</b>
<b>Section 2</b>	<b>Site Background.....</b>	<b>2-1</b>
	2.1 History.....	2-1
	2.2 Summary of Previous Activities .....	2-1
<b>Section 3</b>	<b>Drum Identification .....</b>	<b>3-1</b>
	3.1 Drum Identification.....	3-1
	3.2 Drum Data Tracking .....	3-1
	3.3 Working Around Drums .....	3-2
	3.4 Drum Staging Area .....	3-2
	3.5 Waste Storage .....	3-3
	3.6 Locating Drums .....	3-3
	3.6.1 Drums at Surface.....	3-3
	3.6.2 Drums In Excavations.....	3-3
<b>Section 4</b>	<b>Drum Recovery.....</b>	<b>4-1</b>
	4.1 Drum Recovery .....	4-1
	4.2 Drum Recovery Equipment .....	4-1
	4.3 Drum Staging Area .....	4-1
<b>Section 5</b>	<b>Drum Sampling.....</b>	<b>5-1</b>
	5.1 Opening Drums.....	5-1
	5.2 Sampling .....	5-1
<b>Section 6</b>	<b>Waste Analysis and Disposal.....</b>	<b>6-1</b>
	6.1 Waste Analysis.....	6-1
	6.2 Disposal Approach.....	6-1
	6.3 Empty Drum Disposal.....	6-2

## List of Figures and Attachments

---

### Figures

Figure 1 Site Location Map

Figure 2 Site Plan

### Attachments

Attachment A Drum Log Sheet

Attachment B OSWER Directive 9380.0-3

Attachment C U.S. EPA 600/2-86/013

Attachment D OSWER Directive 9380.0-3



This Drum Management Plan (DMP) addresses the procedures for handling the disposal of drums and their contents that may be discovered at the Albion-Sheridan Township Landfill (ASTL) as required by the Unilateral Administrative Order Statement of Work (1995) Section II, Paragraph 3. Drums addressed by this plan are only those drums that may be exposed or uncovered during activities conducted as part of the Remedial Action (RA). This plan will be used by field personnel during implementation of the drum removal phase of the RA and also during construction of the site cap should any drums be uncovered during these construction activities. The Health and Safety Plan (HASP) for the ASTL Site must be followed in conjunction with safety procedures described in the DMP. The DMP is a supplemental document to the final design submittal for the ASTL Site.

The DMP is organized into six sections and four Attachments that describe the handling of drums from identification through final disposal. The following list presents a summary of the organization of this DMP.

- Section 1.0 provides a general overview of the DMP.
- Section 2.0 presents site background information.
- Section 3.0 describes drums, drum handling and drum staging.
- Section 4.0 describes drum recovery and removal.
- Section 5.0 briefly outlines sampling procedures for disposal.
- Section 6.0 outlines the procedures for waste stream analyses and disposal.
- Attachments provide standard procedures and examples for establishing waste compatibility, characterization, and drum handling.

Procedures described in the DMP follow protocols from federal guidance. Relevant portions of OSWER Directive 9380.0-3 for drum handling and sampling are presented in Attachment B. Guidance for waste consolidation and recontainerization is presented in Attachment C and was taken from "Drum Handling Practices at Hazardous Waste Sites (EPA/600/2-86/013). Attachment D, also from OSWER Directive 9380.0-3, summarizes an example waste bulking and consolidation protocol.

## **2.1 HISTORY**

The ASTL Site is an inactive landfill located at 29975 East Erie Road approximately one mile east of Albion, Michigan on the eastern edge of Calhoun County (Figure 1). The site occupies approximately 18 acres. The site is surrounded by a combination of residential, agricultural, commercial and industrial properties. One residence is located immediately adjacent to the landfill to the south and five additional residences are located approximately 1,000 to 1,500 feet (ft) southwest of the landfill along East Erie Road. An active railroad track borders East to the south of the landfill, and beyond the railroad tracks lies the North Branch of the Kalamazoo River. South of the river is agricultural land. The site does not fall within the flood plain of the river, and are not expected to be impacted by site activities.

The ASTL Site (Figure 2) has been used as a sand and gravel borrow pit and also used for open, unpermitted dumping for an unspecified period of time prior to 1966. From 1966 to 1981, the landfill was privately owned and operated by Mr. Gordon Stevick. The landfill accepted municipal refuse and industrial wastes from households and industries in the City of Albion and nearby townships. In the early 1970s, the Michigan Department of Natural Resources (MDNR) approved the landfill to accept an estimated 6,000 cubic yards of metal plating sludges. Other materials, such as paint wastes and thinners, oil and grease, and dust, sand and dirt containing fly ash and casting sand were also disposed of at the site; the sludge remains buried at the site. The landfill ceased operation in 1981.

## **2.2 SUMMARY OF PREVIOUS ACTIVITIES**

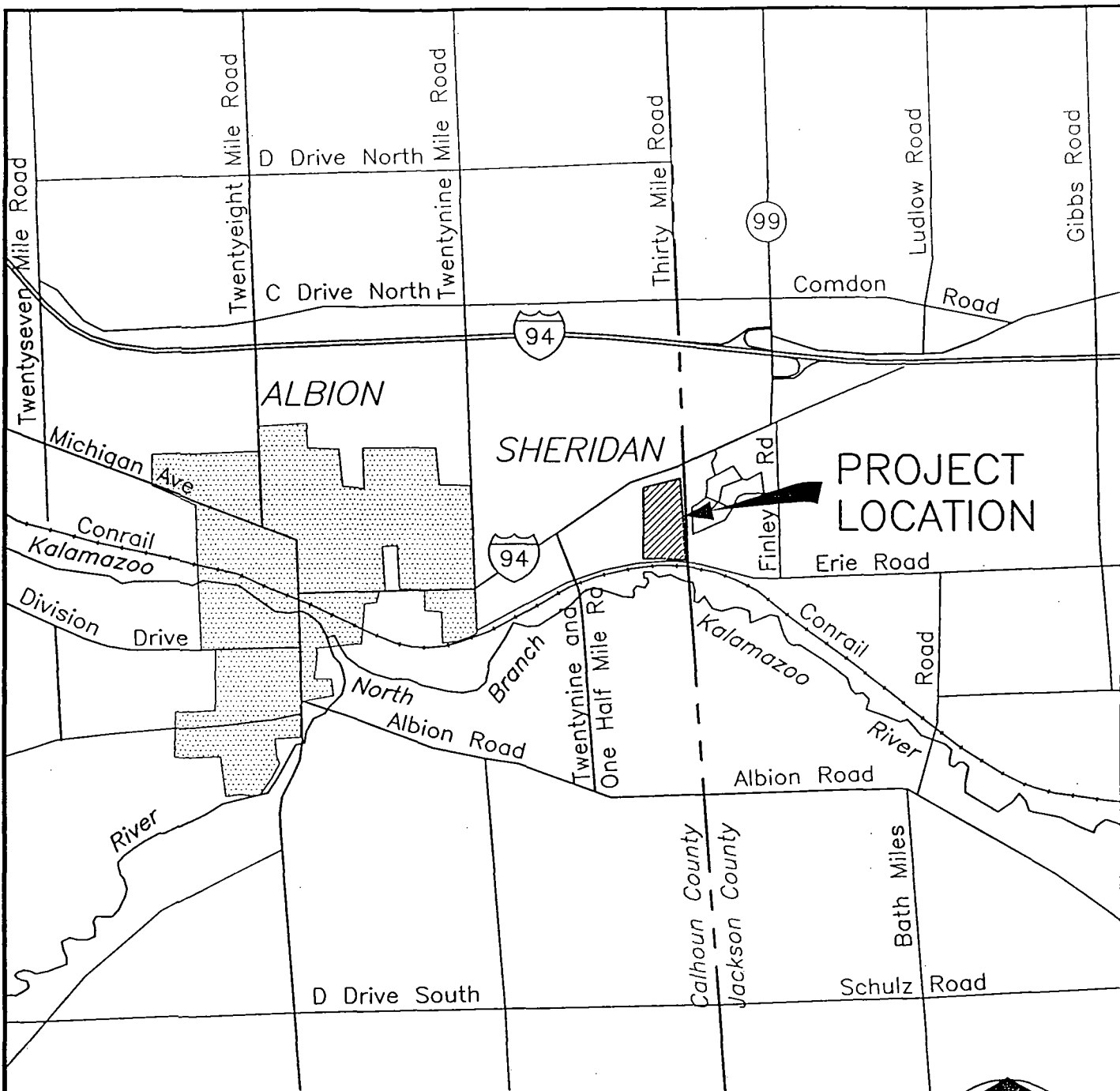
In 1986, A. U.S. EPA Field Investigation Team (FIT) contractor, performed a site screening inspection to score the site for the Hazard Ranking System (HRS). In 1988, the U.S. EPA proposed that the site be included on the National Priority List (NPL), and in 1989, the site was officially placed on the NPL and designated a Superfund site.

During 1988 and 1989, a U.S. EPA technical team observed surface debris on the landfill, including drums which appeared to contain grease and paint waste. Some of the waste was later classified RCRA hazardous waste for toxicity and ignitability. Some waste samples contained VOCs, including ethylbenzene, toluene, tetrachloroethylene, 1,1,1-trichloroethane, and xylene. On March 19, 1990, the U.S. EPA issued a Unilateral Administrative Order (UAO) to five potentially responsible parties (PRPs) stating that removal action was appropriate, and on May 3, 1990, the UAO was amended to delete one of the parties.

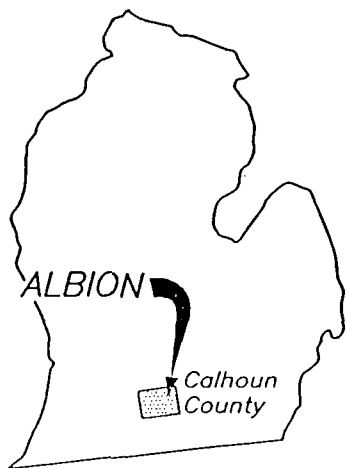
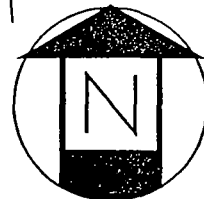
Later in 1990, two PRPs performed the removal of approximately 46 drums from the surface of the landfill. Twenty-two drums were overpacked and sent to an off-site facility for incineration. The remaining 24 drums were crushed and sent to a Type 2 landfill.

In 1991, the site was selected for the presumptive remedy for CERCLA municipal landfill sites, one of the clean-up accelerating Superfund tools.

U.S. EPA initiated the RI/FS in January 1992, and the completed work reports (Final Remedial Investigation Report of the Albion-Sheridan Township Landfill, Albion, Michigan, April, 1994 and the Final Presumptive Remedy Feasibility Study Report of the Albion-Sheridan Township



**VICINITY MAP**  
NOT TO SCALE



ALBION-SHERIDAN TOWNSHIP LANDFILL  
ALBION, MICHIGAN



**Woodward-Clyde Consultants**

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

**SITE LOCATION MAP**

DRN BY: KAH

DATE: MAY 1997

PROJECT NO.

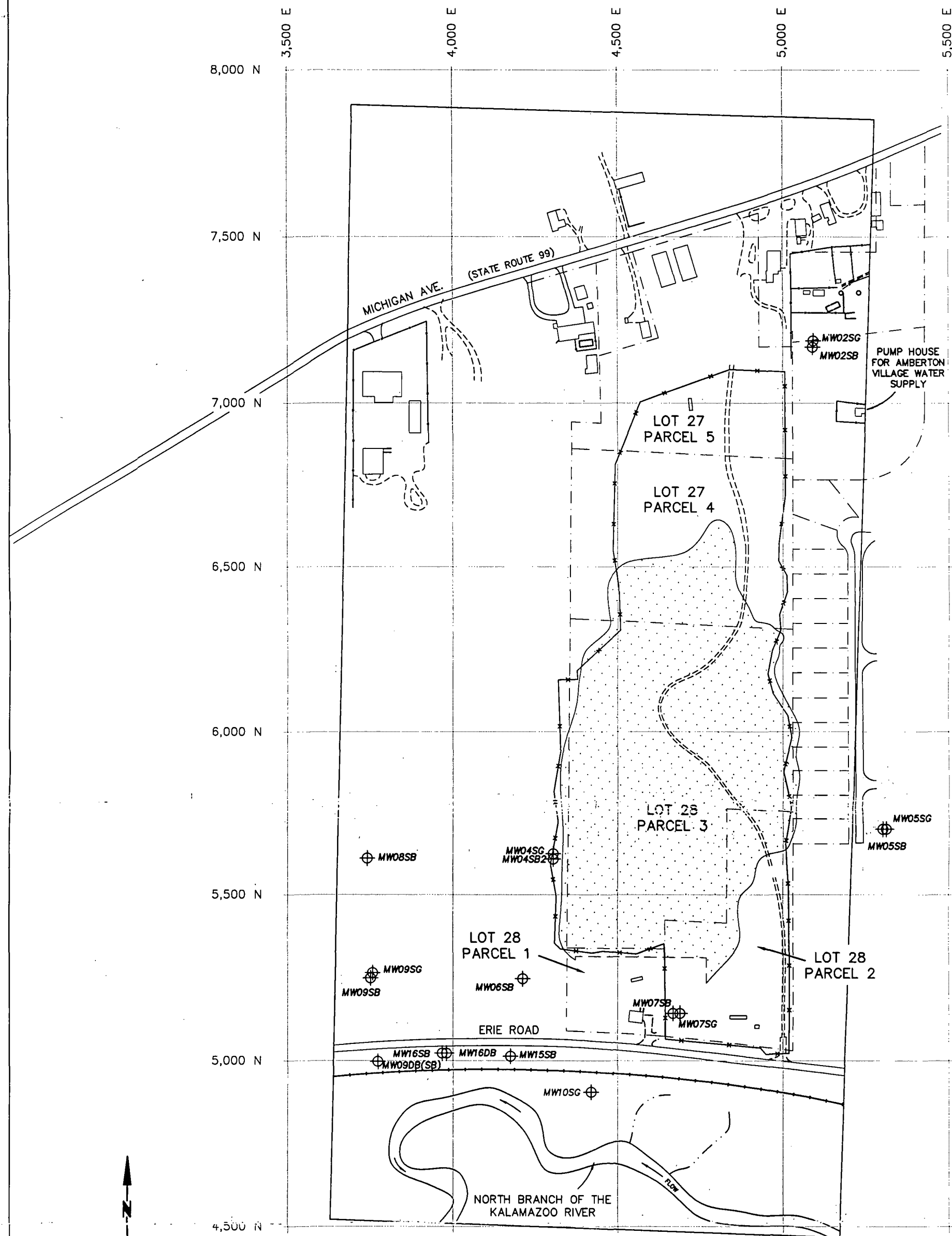
FIG. NO.

CHK'D BY: DS

DATE: MAY 1997

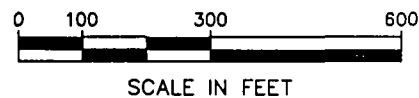
6E13045

1



### LEGEND

- APPROXIMATE LANDFILL BOUNDARY (DASHED PORTIONS INDICATE THE SURVEY GRID BOUNDARY)
- UNPAVED ROAD
- INTERMITTENT STREAM
- FENCE LINE
- RAILROAD TRACK
- MONITORING WELL LOCATION
- PROPERTY BOUNDARY



ALBION-SHERIDAN TOWNSHIP LANDFILL  
ALBION, MICHIGAN



**Woodward-Clyde Consultants**  
ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

### SITE PLAN

DRN BY: SWH	DATE: AUG. 1997	PROJECT NO. 6E13045	FIG. NO. 2
CHK'D BY: DS	DATE: AUG. 1997		

Landfill, Albion, Michigan, September, 1994) performed by WW Engineering & Science (WWES) were placed in the Administrative Record in late 1994.

U.S. EPA decided on a remedial action to be implemented at the site and executed a ROD in March, 1995, on which the state has given its concurrence.

On June 6, 1995, the U.S. EPA issued special notice letters to respondents to initiate negotiations on a consent decree for performance of the Remedial Design/Remedial Action (RD/RA) for the site. Respondents declined to enter in accordance with the ROD and the Statement of Work (SOW) for the site so the Agency issued a Unilateral Administrative Order (UAO) on October 11, 1995.

The Group retained Woodward-Clyde in March, 1996 to assist their implementing the RD/RA. Pre-design studies field work were completed during August, 1996 and the completed Pre-Design Studies Report, Albion-Sheridan Township Landfill Calhoun County, Michigan, dated December, 1996 (PDR), was approved by U.S. EPA on December 4, 1996. The pre-design studies consisted of installing additional groundwater monitoring wells, groundwater sampling and analyses, site surveying, further delineating the horizontal and vertical extent of waste, performing a native species revegetation study and conducting an air emissions study. The preliminary design for the RA was submitted in January 1997.

### **3.1 DRUM IDENTIFICATION**

This DMP defines a drum as 50% to 100% of the original 55-gallon metal drum and any visually identifiable unnatural material related to, in contact with or contained in the metal drum.

This definition will be used by field personnel to decide when the DMP should be followed. Drum fragments less than 50% of the original metal drum will be collected, temporarily staged for identification and returned to the landfill for disposal. Paper, plastic or fiber containers will not be considered as drums for this DMP. Pressurized cylinders, if encountered, will not be considered drums. They will be returned to the site if encountered during excavating.

### **3.2 DRUM DATA TRACKING**

When a drum is found, it will be assigned an identification number that will be recorded in a logbook and on the drum. The identification number will be used during sampling, tracking and disposal. Documentation for each drum and its contents must be maintained from discovery to disposal so that each step is performed only once, hazardous materials are not mixed with non-hazardous materials, and incompatible wastes are not combined.

The numbering system for identifying each drum will be based on the contents of the drum, on the date of discovery, and in the order in which it is discovered. Examples of the numbering system are listed below.

- E 10-22-97A - Empty, October 22, 1997, first drum discovered that day
- S 10-22-97B - Solids, October 22, 1997, second drum discovered that day
- L 10-22-97C - Liquids, October 22, 1997, third drum discovered that day

Examples of prefix letter codes are listed below:

- E - Empty
- L - Liquids
- S - Solids
- G - Grease, and or sludge

A photograph of each drum with the identification number will be taken before the drum is recovered. A drum log sheet will be filled out for each drum by the field manager, the sampling team leader, or the health and safety officer. The photograph of each drum will be attached to the corresponding drum log. An example of the Drum Log Sheet is presented in Attachment A.

The drum identification number will be marked on the drum with a paint stick or spray paint to make a permanent mark. If a drum is to be placed into an overpack drum, the overpack drum must be marked with the drum's identification number before the drum is packed. The identification number must be clearly marked and visible from discovery until disposal.

The exact number of drums that may be discovered during the RA field activities is assumed to be approximately 200 to 400 drums. If more than 50 drums are discovered over a relatively short time period (1 week), a computer database will be established to track analytical results, waste stream segregation, and final disposal of the drums and their contents.

### **3.3 WORKING AROUND DRUMS**

Personnel involved in handling and transporting drummed waste shall work in teams containing no fewer than two people. Personnel will wear protective clothing as required in the HASP (located in Volume 2 of 3 of the final design submittal) with the addition that full-face respirators and a supply of air will be available. Visual contact shall be maintained between members of the team at all times. All team members shall be able to communicate between themselves.

Prior to physically handling a drum, but after assigning a drum tracking number, the following preliminary classifications check list shall be completed on the Drum Log Sheet.

1. Does a Geiger Counter indicate the drum is radioactive?
2. Does the drum exhibit leakage or deterioration, (i.e., is it unsound)?
3. Does the drum exhibit apparent internal pressure (i.e. is it bulging)?
4. Is the drum empty?
5. Does the drum contain markings which would indicate that the contents are potentially explosive?
6. Are organic vapors present around the drum?
7. Are the contents of the drum solid or liquid?
8. Was the drum buried or at the surface?
9. Are there any further observations?

### **3.4 DRUM STAGING AREA**

A drum staging area will be established due south of the TP09 drum area at the southern end of the waste consolidation area within a fenced compound prior to initiating waste relocation or drum removal activities. The compound will be locked at all times except when moving or sorting drums.

The drum staging area will be excavated with a 2-ft deep sump constructed at one end of the building and the entire structure covered with a 40 mil HDPE liner. The liner will be anchored outside the toe of the berm to prevent shifting of the liner. The floor will be designed such that any liquids will drain to the sump, and the sump will be accessible by a pump so that liquids can be removed. The drum staging area, including the sump and pump capacity, will be adequate to contain runoff from a 10 year, 24-hour storm and be of adequate capacity to contain 110% of the stored volume of liquid contained within the staging area. Sand, without other debris or foreign materials, will be placed over the liner to make a level floor for drum storage. Geotextiles may be used to reinforce the sand and improve trafficability. Caution tape will be used to separate the

different waste streams and to control access. Configuration of the drum staging area shall be approved by the Engineer prior to placement of excavated drums.

### **3.5 WASTE STORAGE**

Consolidation of waste is the most efficient method of handling drummed waste and will necessitate temporary storage during RA activities. The drummed waste will be consolidated based on waste stream and compatibility. Liquid waste will be stored on the lined pad, and solid waste will be stored in covered roll-off boxes or on the lined pad. Drums not containing waste or solid waste that is below the action levels as determined by the U.S. EPA and MDEQ shall be incorporated under the landfill cap. All materials will remain in the staging area until removed from the site.

### **3.6 LOCATING DRUMS**

The finding of drums will be either a part of the removal near TP09 or incidental to field activities planned for the RA. Drums may be discovered either on the surface or during regrading or waste relocation activities. Two different approaches are outlined below to address each situation.

#### **3.6.1 Drums at Surface**

Field teams that encounter a drum on the surface should mark its location on a map and assign the appropriate drum tracking number. The drum tracking number will be marked on the drum after following precautions described in the HASP for the ASTL Site to ensure the safety of field team members. The drum will then be encircled with caution tape or flagging tape and additional tape tied to a nearby tree branch or wooden lath to aid in relocating the drum.

#### **3.6.2 Drums in Excavations**

When a drum is encountered while excavating, the excavation activity will stop, and the appropriate information for the Drum Log Sheet will be recorded. If the drum can be moved safely, a sheet of plastic or an overpack drum will be prepared to accept the drum and any obviously stained soils on material spilled from the drum. All drums that appear to contain liquids will be placed into overpack drums. Drums containing solid materials will be placed on plastic or in an overpack drum. The drum will be numbered using the numbering system detailed in Section 3.2. Excavating then can resume.



## **4.1 DRUM RECOVERY**

Drums will not be handled manually. A drum will not be handled or moved until equipment is available to open, sample, and transport the drums to the staging area.

Drums found during the drum removal phase or cap construction must be removed from the excavations as soon as safely possible so as not to impede field activities. Overpack recovery drums and plastic must be available on site before any digging occurs.

Drums removed from an excavation will be placed besides the excavation on a temporary storage pad. Plastic will be spread out to recover any spilled drum contents. Drums that are deteriorated or appear to have liquids in them must be placed into overpack drums. Drums that are in fair condition, contain solid material, or are empty can be placed on the plastic sheeting.

Drums will be encircled with caution tape and the drums and location recorded in a log book. All drums will be transported to the staging area by the end of the day.

## **4.2 DRUM RECOVERY EQUIPMENT**

The recovery of drums from surface locations or excavations will require the use of specialized equipment. Surface drums likely will be partially buried and will need to be excavated. Bobcats, trackhoes or backhoes are best suited for moving drums. A toothless bucket or drum grapppler attachment works best for moving and not damaging drums. A drum grapppler attachment is the most efficient way to handle drums if there are numerous drums to handle. An explosion proof shield is required for the equipment operator. If a drum exhibits evidence of being under pressure (bulging) or containing explosive, reactive, shock-sensitive, radioactive or medical waste, special handling is required. Special handling requirements and procedures are listed in Attachment B.

## **4.3 DRUM STAGING AREA**

When drums are brought in to the staging area they will be segregated based on liquid or solid contents. A log book will be kept for the drum staging area. The log book will contain the drum identification numbers, waste characterization results and disposal fate of each drum. If more than 50 drums are handled, a computer data base will be established to track the fate of the drums.

Drums must be staged so that identification numbers are clearly visible and so that each drum is easily accessible. Adequate aisle space must be maintained for unobstructed movement of personnel, fire protection equipment, spill control equipment and materials, and decontamination equipment. Only rubber-tired equipment will be allowed in the staging area. Authorized personnel only will be allowed to enter the drum staging area.

The sump of the drum staging area must be inspected daily during work days and whenever a spill has occurred. Fluids collected in the sump shall be pumped to a drum or poly-tank staged adjacent to the sump. Disposable absorption materials must be staged and kept dry until use, at the drum staging area. Fluids in quantities less than the volume capable of being pumped, shall

be removed from the sump using disposable absorption materials. Used absorption materials will be placed in the covered roll-off containers for waste characterization. Liquid collected from the sump will be treated as a liquid waste and may require analytical characterization prior to evaluation of disposal options.

Punctures or tears in the drum staging area liner will be repaired. Protective soil will be removed to expose the damaged area. The damaged portions will be repaired by patching and welding if feasible. If necessary, depending on the severity of the damage observed, the liner will be replaced.

The drum staging area will be divided into waste stream areas. When waste characteristics have been established, compatible wastes will be combined for disposal. The method(s) for waste consolidation will depend on the determination of the type and volume of waste contained in the drums. Waste characterization, consolidation, and recontainerization activities performed at the ASTL Site will adhere to the practices presented in Appendix B of OSWER Directive 9380.0-3, "Drum Handling, Drum Sampling, Special Waste Handling, and Tank Sampling Protocol", Appendix C of OSWER Directive 9380.0-3, "An Example of Bulking and Consolidation Protocol," and in Section 9 of EPA's Publication No. 66/2-86/013, "Drum Handling Practices at Hazardous Waste Sites." A copy of this information is included as Attachments B-D of this DMP.

Empty drums will be crushed and put back into the landfill. Drums will be placed in areas that are either exposed (i.e. test pits) or in shallow excavations within the limits of areas that will be capped by the cover system. Drums will be crushed using heavy equipment (i.e. excavator, or dozer) prior to burying. Prior to cover construction, the contractor will be required to place and compact general fill over the buried drums.

## **5.1 OPENING DRUMS**

Intact drums recovered from the site may contain unknown materials, and there is danger of ignition and/or detonation when they are opened. Bulging drums are under pressure, and the pressure must be relieved safely before they can be sampled.

Drums will be opened and sampled after:

- The HSO or Team Leader decides it can be done safely,
- Full-face respirators and a supply of air are available (Level B),
- The drum is upright and on plastic or in a overpack, and
- Equipment to move the drum to the staging area is available.

All intact drums will be opened remotely prior to moving the drum to the drum staging area. Drums may be opened with a non-sparking remote hydraulic plunger or a non-sparking backhoe spike. All drum contents will be screened with a photoionization detector, explosimeter, oxygen level monitor and Geiger counter before sampling. The team leader must make the decision to proceed with the sampling based on the results of the screening.

## **5.2 SAMPLING**

The sampling of drums must adhere to the following Standard Operating Procedures (SOPs) contained in Attachment A of the Operation & Maintenance Plan (Appendix D of Volume 1).

- SOP-03: Sample Custody Protocols and Field Documentation
- SOP-04: Calibration and Maintenance Procedures
- SOP-05: Quality Assurance/Quality Control Sampling

Samples collected from the drums will be identified using the drum identification number followed by a 2 digit sample number. For example, if a liquid sample is the second sample collected from the third drum discovered on October 23, 1997, the sample will be identified as L 10-23-97C-02. The material in the drums will be classified as either solids, sludges, or liquids.

The solid material sample in drums may vary from powdery material to solidified material. The technique used to collect samples from the solids should follow the SOP for soil sampling. Sixteen ounces of sample will be sufficient. Solidified or similar material may require the use of a spark-proof chisel or other spark-proof tools to break off adequate sample volumes.

The procedures for sampling of liquid and sludge materials can be found in Attachment C. The protocol is from OSWER Directive 9380.0-3. One 500-ml bottle will be sufficient volume.

The drum sampling will initially evaluate the compatibility of the drum contents with other drum contents. The purpose of evaluating the compatibility is so that the materials can be stored and/or bulked together for disposal. When a container is full or site activities are concluded, the bulk containers will be disposed.

## **6.1 WASTE ANALYSIS**

The analysis of drum contents will be performed in two phases. Initially, for the drummed waste, the analytical laboratory will perform compatibility testing on all phases collected from each drum sample. Compatibility testing will be performed to identify similar waste streams.

During the second phase of analysis, individual drum compatible waste streams will be generated by compositing similar compatible wastes into one or more samples per waste stream. Waste characterization analyses will be conducted on each composited compatible waste stream to identify whether the waste is hazardous in accordance with 40CFR 261. The analytical results from the detailed waste characterization analyses will be used to aid in determining the most acceptable disposal mode for each compatible hazardous waste stream.

The cleanup contractor will be responsible for devising the initial compatible waste streams and determination of appropriate analytical testing. At a minimum, the waste will be tested to see if it is characteristic hazardous waste in accordance with 40CFR 261.10, 20, 21, 22, 23 and 24 and Appendices I, II and III. The Engineer will have overall responsibility for approval or any modifications to the proposed compatible waste streams and analytical testing.

Compatibility testing and detailed waste characterization protocols have been developed by several cleanup contractors. The DMP approach to waste analysis will be to follow the U.S. EPA guidance document "Drum Handling Practices at Hazardous Waste Sites" (EPA/600/2086/013).

The protocols cited in this document will be used as guidance and will most likely be modified to meet current analytical testing requirements (i.e., EPTOX has been replaced with TCLP analyses, and the paint filter test has been developed to determine whether a sample is a solid or liquid) and the requirements of prospective treatment/disposal facilities.

If analysis of samples of drummed material indicate that the material is hazardous, the drums and their contents will not remain on site for more than 90 days after transport to the drum staging area. After receipt of analytical results but prior to arranging removal, wastes will be evaluated against land disposal restrictions to identify proper receiving treatment, storage and disposal (TSD) facilities. Drums containing solid wastes that do not trigger land disposal restrictions may be incorporated into the landfill under the landfill cap.

## **6.2 DISPOSAL APPROACH**

The DMP approach to disposing of the drum waste materials will be to follow the U.S. EPA guidance document "Drum Handling Practices at Hazardous Waste Sites" cited earlier (EPA/600/2086/013). The U.S. EPA guidance document suggests consolidation and recontainerization of drum contents. This approach is described in Attachment D taken from the U.S. EPA guidance document.

Liquid waste presents unique and more difficult handling problems. Each drum with liquids in it will be disposed of as they are recovered and characterized. Unless a large number of drums with liquids are uncovered, consolidation of liquids will not occur.

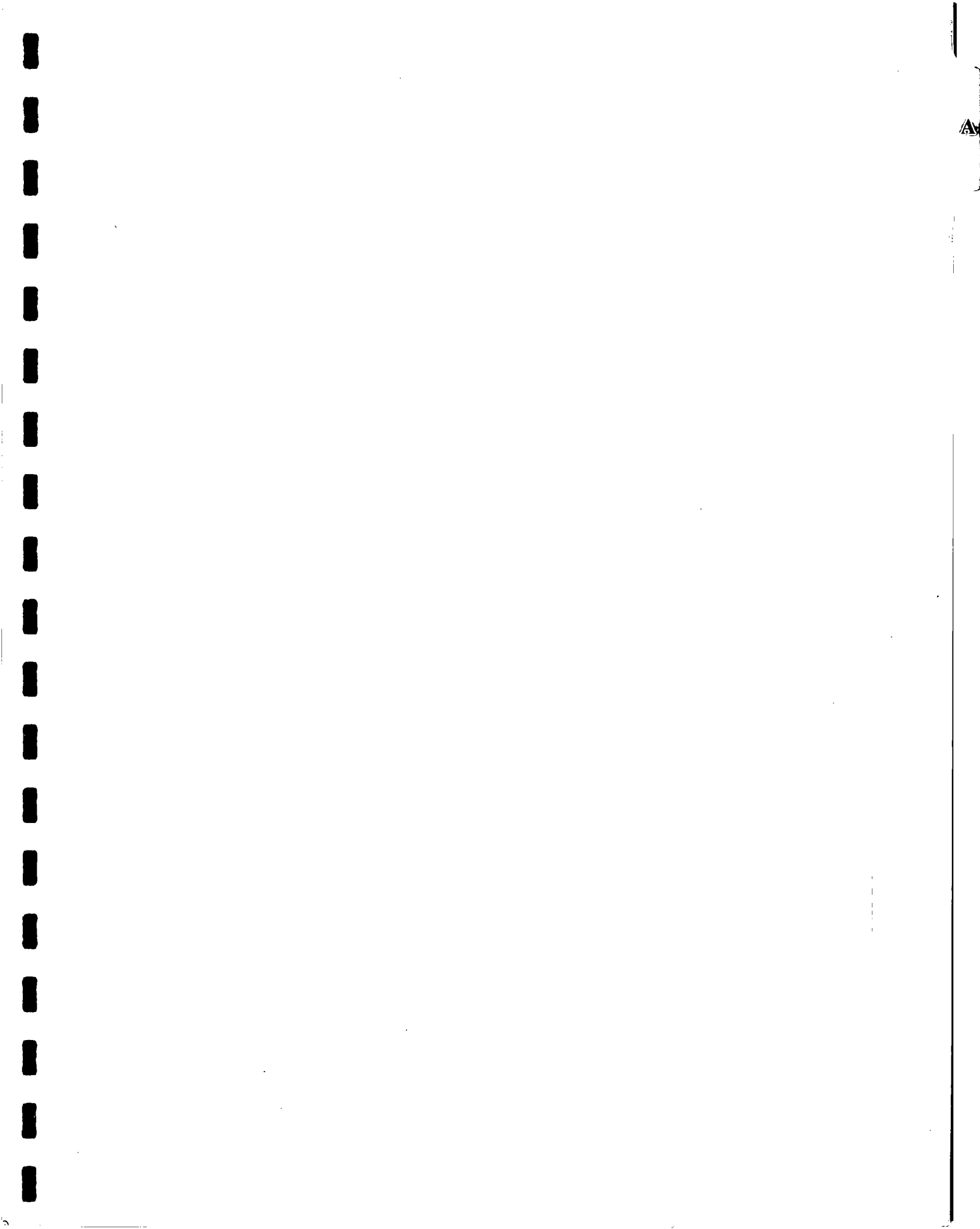
Waste recovered from drums will be characterized and disposed of in accordance with all applicable or relevant and appropriate regulations for the material.

### **6.3 EMPTY DRUM DISPOSAL**

Empty drums generated as a result of consolidation will be checked for liquid and solid residue. Drums containing more than 2 inches of residue will not be considered empty. Liquid residue will be transferred to a container for disposal. Solid residue will be shoveled or scraped out and transferred to a bulk storage container.

Portable hydraulic drum crushers are generally the most efficient method for crushing large numbers of drums. The front bucket of a backhoe can be used to crush drums if only a few drums are recovered. The crushed drums will then be put back into the site for disposal. The drums will be placed in areas that are either exposed (i.e. test pits) or in shallow excavations within the limits of areas that will be capped by the cover system. Drums will be crushed using heavy equipment (i.e. excavator, or dozer) prior to burying. Prior to cover construction, the contractor will be required to place and compact general fill over the buried drums.





**Attachment A**  
**Drum Log Sheet**



**Attachment A**  
**Drum Log Sheet**

h) Are there any further observations?

Y N

Describe:

---

---

---

---

1) Sampling, Handling, and Analyses

Drum opened on \_\_\_\_\_ by \_\_\_\_\_.  
Date

Drum sampled on \_\_\_\_\_ by \_\_\_\_\_.  
Date

Chain of Custody attached on \_\_\_\_\_ by \_\_\_\_\_.  
Date

Sample sent to \_\_\_\_\_.

Drum moved to staging areas on \_\_\_\_\_ by \_\_\_\_\_.  
Date

Analyses received and attached on \_\_\_\_\_ by \_\_\_\_\_.  
Date

Summarize results:



**Attachment B**  
**OSWER Directive 9380.0-3**

**D Bulged Drums**

1. Drums which potentially may be under internal pressure, as evidenced by bulging, shall be sampled in place. Extreme care shall be exercised when working with and adjacent to potentially pressurized drums.
2. Should movement of a pressurized drum be unavoidable, handling shall be by a grappler unit constructed for explosive containment. The bulged drum shall be moved only as far as necessary to allow seating on firm ground or shall be carefully overpacked.
3. Openings into pressurized drums shall be plugged and the bung holes fitted with pressure venting caps set at 5 psi release.

**E Drums Containing Explosive or Shock Sensitive Waste**

1. Drums that contain wastes that have been identified by sampling, or are suspected by visual examination to be explosive in nature, shall be handled with extreme caution. Initial handling shall be by a grappler unit constructed for explosive containment. Drums shall be palletized prior to transport to high hazard interim storage and disposal area.
2. If at any time during remedial activities, an explosive, pursuant to provisions of Title 18, U.S. Code, Chapter 40 (Importation, Manufacture, Distribution, and Storage of Explosive Materials, 1975 Explosives List) is identified, it should be secured and the appropriate state and federal agencies notified.
3. Identification of an explosive substance during the course of a remedial action is usually based on the experience of the on-site personnel. Potentially explosive materials usually may be identified by their physical characteristics -- texture, color, density, etc., as well as the way they are packaged or labeled. Most explosives are solids. In some cases they are packaged in water-tight containers to exclude water, while in other cases they are packaged wet to preclude explosion.
4. Prior to handling or transporting drums containing explosive wastes, personnel working in the area shall be removed to a safe distance. Continuous contact with the communication base shall be maintained until handling or transporting operations are complete. An audible siren signal system, similar to that employed in conventional blasting operations, shall be used to signify the commencement and completion of explosive waste handling or transporting activities.

**F Drums Containing Radioactive Waste**

1. Drums containing radioactive wastes shall not be handled until radiation levels have been determined by an initial field survey conducted by the contractor. Survey shall include direct gamma readings and laboratory analysis of drum surface wipe samples.

I Gas Cylinders

1. Gas cylinders, when encountered, should be stored and disposed of on a specific case basis depending on the integrity of the cylinders and type of substance they are expected to contain.

J Empty Drums

1. Empty drums containing less than 1 in. of solid residual waste and those resulting from on-site bulking and repack operations shall be loaded by grapples into transport equipment and placed within the empty drum staging area. Residuals, where possible, shall be transferred to repack containers prior to movement. Additional information on the definition of empty drums can be found in 40 CFR 261.7. Also, limitations on the reuse of drums can be found in 49 CFR 173.28.

K General Drum Handling Procedures

1. The handling, movement, and transport of drums should be by use of mechanical equipment only; no drums should be handled manually.
2. Remote drum handling equipment shall consist of a grapple equipped backhoe or front end loader. Drum transportation should be with front end loaders or fork lifts with modified carrying platforms.

Portions of equipment that contact drums or canisters should be constructed of non-ferrous metals or contact portions should be coated or lined to preclude spark generation.

Handling and transport equipment should be equipped with full frontal and side splash and explosion shields. Class ABC fire extinguishers shall be fitted to the body of each piece of equipment.

Equipment should be maintained in first class condition. The ignition manifold and exhaust components shall be maintained to prevent backfiring or generation of sparks within the exhaust gases.

entered with a hydraulic penetrating device operated remotely. All openings shall be plugged except during sampling operation.

**B Specific Sampling Procedure Using a Glass Thief**

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About 1 ft. of tubing should extend above the drum.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper, ensuring liquid does not come into contact with stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on the outside of the sample container.
6. Release the stopper and allow the glass thief to drain completely and fill the sample container. Fill the container to about 2/3 of capacity.
7. Remove tube from the sample container, break it into pieces and place the pieces in the drum.
8. Cap the sample container tightly and place prelabeled sample container in a carrier.
9. Replace the bung or place plastic over the drum.
10. Transport sample to on-site laboratory for analysis.

**C Sample preservation and packing procedures for drummed waste samples**

1. No preservatives shall be used.
2. Place sample in a ziplock plastic bag.
3. Place each bagged container in a 1-gallon covered can containing absorbent packing material. Place lid on can.
4. Mark the sample identification number on the outside of the can.
5. Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

**D Considerations for Analytical Program**

At the certified laboratory, each of the waste phases from all tanks should first be tested for compatibility. Many wastes, when mixed with others, can produce potentially adverse human health and environmental conditions

TANK SAMPLING PROTOCOL

## A Regulatory Requirements

1. Guidelines have been developed to ensure the safety of the operations personnel which shall be consulted by the contractor. These are as follows:
  - a. OSHA - "General Duty Clause", Section 5 A-1 of the Occupational Safety and Health Act (Public Law 910596).
  - b. NIOSH - "Criteria for Recommended Standard; Working in Confined Spaces", Publication No. 80-106.
2. In addition, reference material shall also be used, such as the Anderson National Standard Institute, Inc. (1430 Broadway, New York, NY 10018) "Safety Requirements for Working in Tanks and Other Confined Spaces", ANSI-Z117.1

## B Tank Structural Survey

The external structural characteristics of each tank and tanker shall be observed and uniquely recorded and potential sampling points shall be evaluated for safety, accessibility and sample quality.

## C Tank Entry Procedure

1. Prior to opening a tank for internal inspection, the tank entry team shall:
  - a. Review safety procedures and emergency contingency plans with the Safety Officer.
  - b. Ensure that tank is properly grounded.
  - c. Remove all sources of ignition from the immediate area.
2. All members of the tank entry team shall be fitted with self-contained breathing apparatus.
3. Each tank shall be mounted using appropriate means and the manway covers removed using non-sparking tools.
4. Obtain and record the following information at each potential sampling location.
  - a. Lower explosion limit (LEL) reading directly above the sampling port and the tank head space.
  - b. Organic vapor concentration directly above the sampling port and in the tank head space.

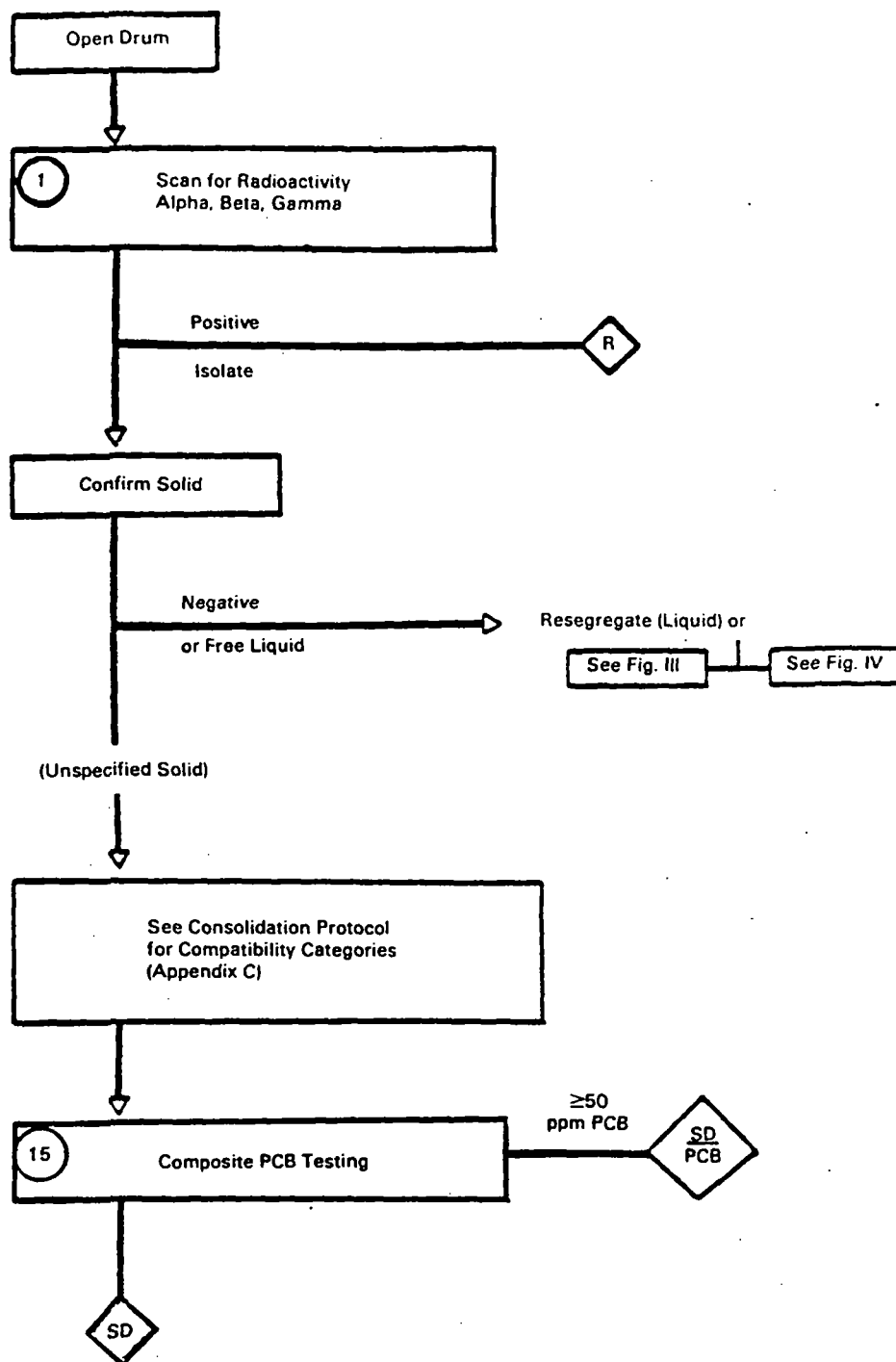
- m. Intrinsically safe high volume blower
  - n. Wide mouth amber glass (550 ml) bottle with teflon cap liner
  - o. Sample identification labels affixed to sample bottle
  - p. Chain-of-Custody forms
  - q. Metal paint can (1 gallon) half-filled with absorbent
  - r. Camera
3. Prior to commencing any profiling, the tank head space shall be cleared of any toxic or explosive vapor concentration using a high volume blower. No work shall start in any tank if the LEL exceeds 10% (as methane).
4. The preliminary safety guidelines outlined above shall be observed.
5. Profiling Procedure
- a. Determine the depth of any and all liquid solid interface using a weighted probe line.
  - b. Determine the depth of any bottom sludge layer using a weighted probe line.
  - c. Collect liquid samples from 1 ft. below the surface, from mid depth of the liquid, and from 1 ft. foot above any bottom sludge layer. Samples shall be collected a weighted bottle sampler (ASTM Method D270).
  - d. Visually compare the three samples. If no visual phase difference is observed, perform field test as required to verify that no phase differences are present in the tank. Field tests selected shall be determined by the type of material found in the tank (organic, aqueous) and include:
    - Specific Conductivity
    - Specific Gravity
    - Refractive Index
    - pH
    - Solubility (water, methanol, methylene chloride)
    - Viscosity
  - e. If any sampling indicated a phase difference, a systematic, interactive sampling procedure shall be performed by halving the distance between two discrepant sampling points until the depth of the phase change can be determined. This phase difference shall be verified by field tests specified in d above.
  - f. Verify the profile information from at least one other access port when possible.



6. Sample bottle openings shall be covered with aluminum foil and capped with teflon lined caps.
7. Sample identification information and locator information shall be recorded in a log book. A descriptive narrative shall accompany each sample obtained from the tanks.

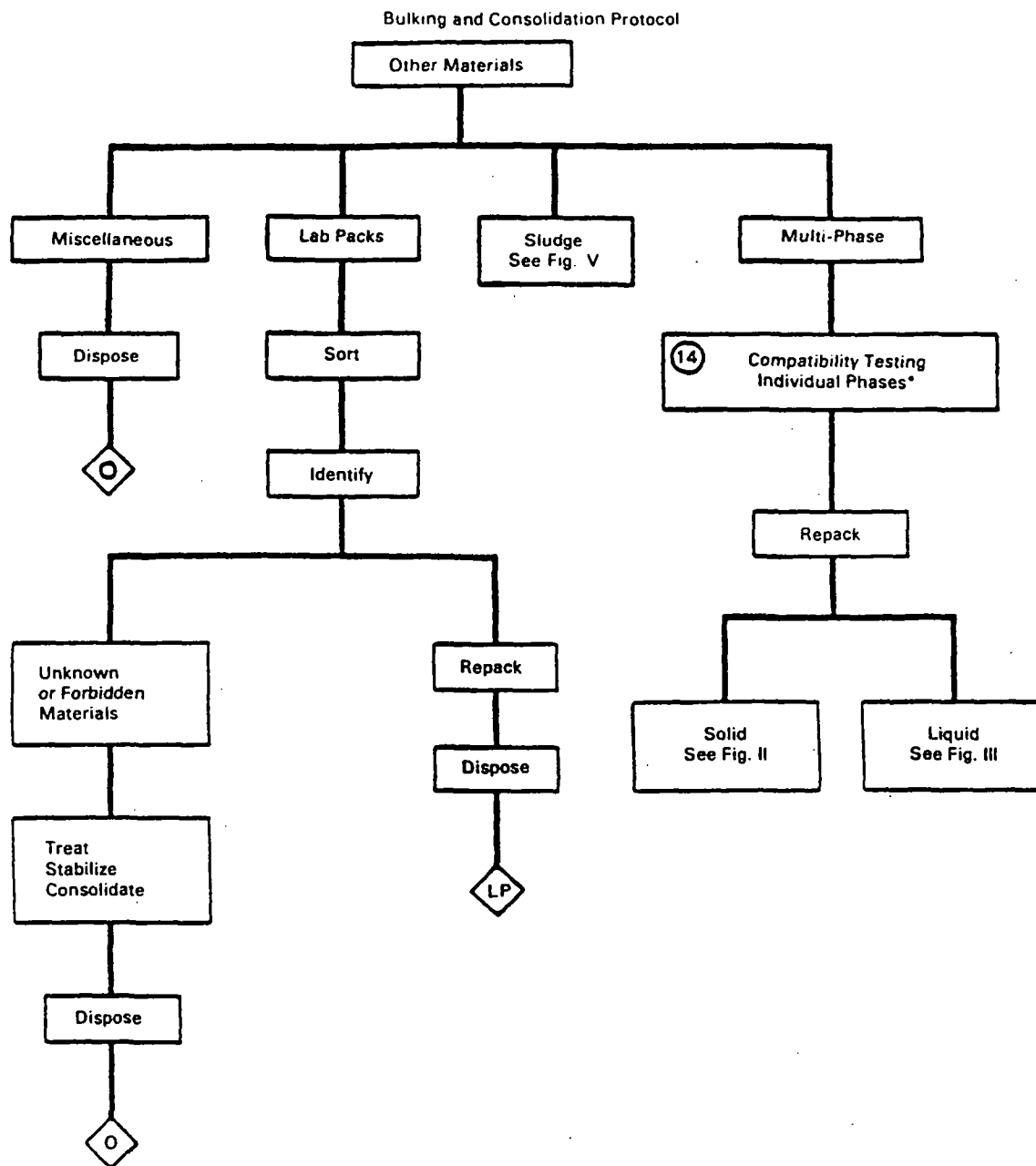
Figure II. Solid materials.

## Bulking and Consolidation Protocol



For SD and  $\frac{SD}{PCB}$  determine flashpoint (17) for ultimate disposal requirements for solid materials.

Figure IV. Other materials



\*If phases are incompatible, they must be separated and repacked.

## FIGURE VI

DISPOSAL CATEGORIES  
(In diamonds on Figures I to V)

R	RADIOACTIVE MATERIAL (Solid or Liquid)
OX	STRONG OXIDIZER
RD	STRONG REDUCING AGENT
WR	WATER REACTIVE MATERIAL
A	AQUEOUS ACID pH <2.0
B	AQUEOUS BASE pH >12.0
PCB 50-500 ppm	PCB CONTAMINATED LIQUID 50-500 PPM
PCB >500 ppm	PCB CONTAMINATED LIQUID >500 PPM
OH	ORGANIC LIQUID WITH HIGH (>2%) HALOGEN CONTENT
OL	ORGANIC LIQUID WITH LOW (<2%) HALOGEN CONTENT
<u>SD</u> PCB	SOLID MATERIAL UNCONTAMINATED (<50 PPM) WITH PCB
S	AQUEOUS BASE CONTAMINATED WITH SULFIDE
CN	AQUEOUS BASE CONTAMINATED WITH CYANIDE
O	OTHER MISCELLANEOUS MATERIALS INCLUDING EXPLOSIVES AND AIR REACTIVE SUBSTANCES
NA	NEUTRAL AQUEOUS, 50 PPM PCB, 2<pH<12, UNCONTAMINATED WITH SULFIDE OR CYANIDE
KN	MATERIAL OF KNOWN ORIGIN AND/OR COMPOSITION

FIGURE VII

ANALYTICAL METHODS  
(Continued)

- DCP - Drum Consolidation Protocol, A Hazardous Waste Site Management Plan (Chemical Manufacturers Association, Washington, D.C., 1982)
- MUHWS - National Conference on Management of Uncontrolled Hazardous Waste Sites (U.S. EPA Hazardous Materials Control Research Institute), October 1981
- SIOC - The Systematic Identification of Organic Compounds, Shriner et al., 5th Edition, Jon Wiley & Sons, New York, NY, 1964
- TBQIA - Text Book Quantitative Inorganic Analysis, Kolthoff, I.M., 3rd Edition, McMillan Co.
- SM - Standard Methods for Examination of Water & Waste Water, 15th Edition, 1980
- SW-846 - Test Methods for the Evaluation of Solid Waste Physical/Chemical SW-846, U.S. EPA, 1984.



**Attachment C**  
**U.S. EPA 600/2-86/013**

## Attachment C

### WASTE CONSOLIDATION AND RECONTAINERIZATION

The activities discussed in this section are designed to achieve two basic objectives:

- Pretreat, bulk, or recontainerize the waste to meet the requirements of the treatment or disposal facility in the most economical way possible
- Put the wastes in a safe and acceptable form for transportation to a permitted treatment/disposal facility.

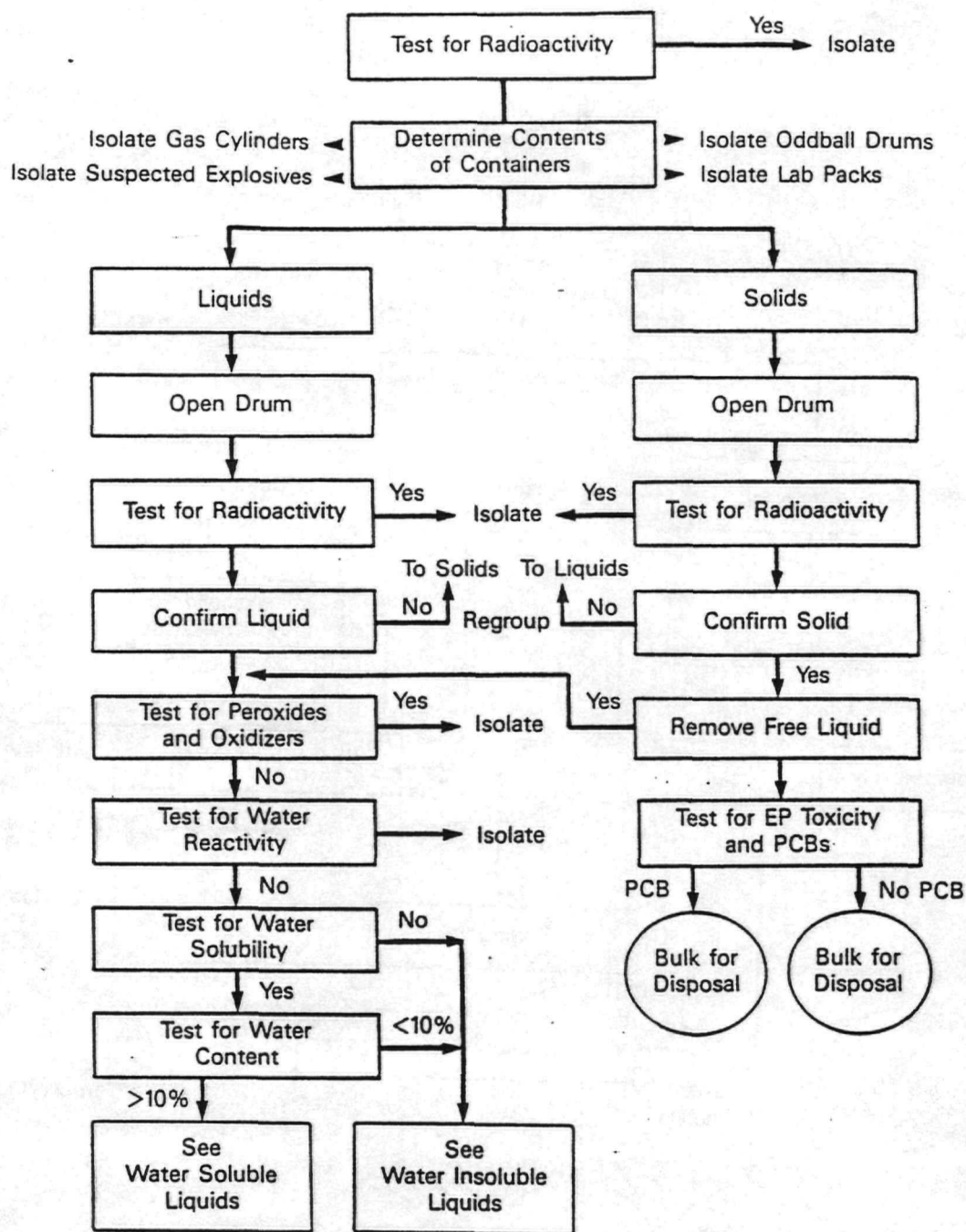
### COMPATIBILITY TESTING

As each drum is opened, it is scanned for radioactivity and, if negative, a sample is taken for compatibility testing. Compatibility testing refers to simple, rapid, and cost-effective testing procedures that are used to segregate wastes into broad categories (i.e., radioactive, oxidative, water reactive). By identifying broad waste categories, compatible waste types can be safely bulked onsite without risk of fire or explosion, and disposal options can be determined without exhaustive and costly analysis of each drum.

Sampling is conducted using a sampling thief for liquids and a coring tool for solids. Solid samples should be taken from several different areas within the drum. In addition, the contents of all drums should be described on the drum data sheet in terms of physical state, viscosity, and number of phases. A sample must be taken for each phase.

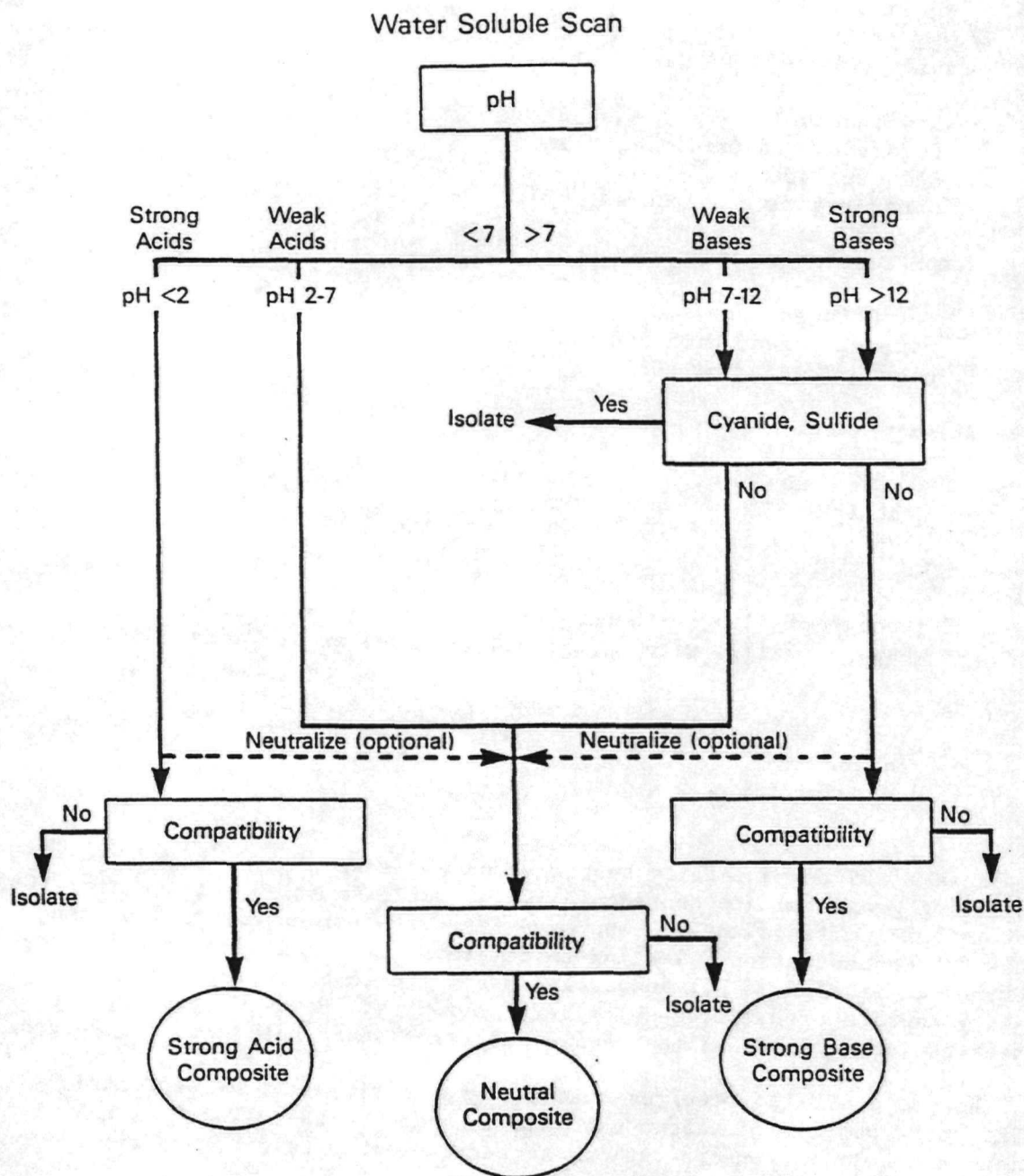
Compatibility testing protocols have been developed by a number of cleanup contractors and waste generators. Often, however, the compatibility testing procedures must be tailored for site-specific conditions or to meet the testing requirements of prospective treatment/disposal facilities. A thorough compatibility testing protocol, developed by Chemical Manufacturers Association (CMA) (1982) is outlined in Figure 38. This protocol has been used in a number of cleanup operations.





**Figure 38. Compatibility Testing Protocol** (Modified by Princeton Aqua Science)  
(Reprinted courtesy of Chemical Manufacturer's Association, Washington, D.C.)





**Figure 38. (continued)** (Modified by Princeton Aqua Science)  
(Reprinted courtesy of Chemical Manufacturer's Association, Washington, D.C.)

Based on the CMA protocol, wastes can be segregated into the following broad waste categories:

- Liquids
  - Radioactives
  - Peroxides and oxidizing agents
  - Reducing agents
  - Water-reactive compounds
- Water insolubles
  - low halogen, low PCB
  - mixed halogen, high PCB
  - high halogen, low PCB
- Acids
  - strong (pH <2)
  - weak (pH 2-7)
- Bases
  - strong (pH >12), with or without cyanides or sulfides
  - weak (pH 7-12), with or without cyanides or sulfides
- Solids
  - radioactives
  - nonradioactive.

These field compatibility testing procedures are only suitable for determining gross halogen content (> 1%). Samples must be retested for PCBs prior to bulking since the EPA-approved disposal options differ depending on the PCB concentration. Testing to determine gross halogen content is sometimes eliminated if all insoluble wastes are to be incinerated at a facility capable of handling chlorinated organics. However, testing for PCBs is required, regardless of the need for testing other halogenated compounds.

The protocol also requires that a compatibility test be performed by mixing small samples of wastes that are intended to be bulked. Visual observations are made for precipitation, temperature changes or phase separation.

There are some differences between the CMA compatibility protocol and the protocol used by some cleanup contractors. One commonly used procedure is to conduct flammability and ignitability tests on a drum-by-drum basis for both liquid- and solid-containing drums. CMA, on the other hand, recommends that these tests be performed on composite samples before bulking since these tests require more costly and time-consuming analysis (torch test and closed cup flame test, respectively). Another common practice not included in the



CMA protocol is to conduct further testing on samples from drums containing solids. These tests may include water reactivity, water solubility, pH, and the presence of oxidizers. In general, the decision to perform these analyses on a drum-by-drum basis rather than on a composite sample (prior to bulking) is made based on the number of drums and the types of wastes known to be present on site.

Hatayama et al., (1980a) have also provided guidance on waste incompatibilities that can be useful during the waste consolidation process. These researchers have developed a "Hazardous Waste Compatibility Chart" (included in the Appendix) that allows the user to evaluate potential adverse reactions for binary combinations of hazardous wastes. Binary waste combinations are evaluated in terms of the following adverse reactions: heat generation from a chemical reaction, fire, toxic gas generation, flammable gas generation, explosion, violent polymerization, and solubilization of toxic substances.

#### TESTING COMPOSITE SAMPLES

A detailed analysis of a composite waste is generally required prior to acceptance by a treatment/disposal facility. Once a significant group of compatible waste types (about 100 drums) have been identified, a PCB analysis must be conducted on subgroups (generally about 5 drums). When a composite sample shows a significant PCB concentration ( $>50$  mg/l), each drum in the subgroup must be analyzed separately. Once a compatible group of samples is identified and PCB-contaminated drums are removed, a final disposal analysis is conducted. Muller, Broad, and Leo (1982) have compared the analytical requirements of a number of disposal facilities and found that the tests identified in Table 18 are representative of tests that may be required prior to acceptance of liquids and solids for disposal.

#### SEGREGATING WASTES BASED ON COMPATIBLE WASTE CLASSES

Once drums have been categorized into compatible waste classes, the drums are assigned a color code that corresponds to their compatibility class (i.e., oxidizers, strong acid, etc.). The drums are then physically segregated on the basis of compatible waste types and consolidation or volume reduction techniques. In this way, compatible waste types can be efficiently combined for final treatment, storage, or disposal. To facilitate easy access to the drums, compatible waste types should be placed in groups of four or in long double rows (CMA, 1982). Spacing between rows or groups should allow easy access to drums by drum handling equipment and rapid exit in case of emergency.

#### TREATMENT/DISPOSAL OPTIONS

Once the wastes have been categorized, they are assigned appropriate treatment/disposal options. These options are selected based on such factors as protection of public health, regulatory requirements, availability and

TABLE 18. POTENTIAL ANALYTICAL REQUIREMENTS FOR DISPOSAL

- 
1. Flammability
  2. pH
  3. Specific gravity
  4. PCB analysis
  5. Thermal content (BTU/lb)
  6. Physical state at 70°F
  7. Phases (layering in liquids)
  8. Solids (%)
  9. Hydrocarbon composition
  10. Pesticide analysis
  11. Sulfur content
  12. Phenols
  13. Oil and grease (%)
  14. Water (%)
  15. Viscosity
  16. Organochlorine percentage
  17. Metals analysis
    - a. Liquids for soluble metals.
    - b. Solids extracted according to the EPA Toxicant Extraction Procedure (24 hr) which shows leachable metals.
    - c. Both liquid and solids checked for concentrations of the following metals:

Arsenic	Mercury
Barium	Nickel
Cadmium	Selenium
Chromium	Silver
Copper	Zinc
Lead	
  18. Both free and total cyanide content checked.
  19. Solids checked for solubility in water, sulfuric acid, and dimethyl sulfoxide.
- 

Reprinted from Muller, Broad, and Leo, 1982. Table originally printed in the Proceedings of the National Conference on Management of Uncontrolled Hazardous Waste Sites, 1982. Available from Hazardous Materials Control Research Institute, 9300 Columbia Blvd., Silver Spring, MD 20910.

appropriateness of Treatment/Storage/Disposal (TSD) facilities, applicability to site specific conditions (i.e., number of drums, location, etc.), and costs.

Treatment or disposal options for specific waste types are covered in detail in numerous reports, several of which are listed in the references. The U.S. EPA (1981b) prepared a useful summary of major treatment and disposal options for various waste categories. The summary is shown in Table 19. Although this table was prepared specifically for the Pollution Abatement Services Site in Oswego, New York, it is generally applicable for most cleanup operations since it identifies the most widely used treatment or disposal option for various broad waste categories. Nevertheless, the selection of the best treatment/disposal option should be made on a site-specific basis.

The major factors to consider in determining the feasibility and effectiveness of the various treatment options are summarized below:

- Incineration: BTU values, organic chlorine, organic sulfur, water content, viscosity, heavy metals (i.e., percent ash), feasibility of onsite incineration, location of a suitable offsite incinerator
- Aqueous Treatment: pH, acidity, alkalinity, flash point, water content, microbial toxicity, TOC, sulfide, cyanide, metals, feasibility of onsite treatment, sludge disposal if treated onsite, onsite pretreatment requirements
- Resource Recovery:
  - organic solvents and nonemulsified oils: PCB content, halogen content, water content, dissolved metals, and other dissolved compounds, BTU value
  - metals recovery: metal concentration, economics of production of the metal from the raw material
- Secure Landfill: water content, PCB content, radioactivity, reactivity, ignitability, presence of carcinogens, presence of toxics
- Solidification/Stabilization: potential for reversal of reactions, costs, status of technology, compatibility of wastes with a solidifying agent.

Location of suitable facilities for final treatment or disposal depends primarily on the specific waste type. The Hazardous Waste Management Directory (1982-1983) (Pennsylvania Environmental Research Foundation, Inc.) identifies treatment/disposal facilities by city and state. The types of wastes handled, the treatment/disposal processes used, and the service are listed for each facility. For radioactive- and PCB-containing wastes (except liquids with <50 ppm PCB) the options are rather limited. Figure 39 shows



TABLE 19. MAJOR TREATMENT/DISPOSAL ALTERNATIVES  
FOR VARIOUS WASTE TYPES

Waste Segregation	Waste Type	Aqueous Treatment	Recovery/ Recycle <sup>a</sup>	Incineration	Solidification Fixation/ Dewatering	Secure Land Burial
Radioactive	Solid Liquid				P P	LD LD
Water Reactive	Liquid	U				
	Solid (alkaline metals)	PS		U		
Strong Reducer	Solid/ Liquid	U				
Strong Oxidizer	Solid/ Liquid	U				
Organic Liquid with Low Halogen Concentration (<2% halides, <50 ppm PCB)	Solvents		PS/U	U		
	Oil		PS/U	U		
	Other		PS/U	U		
Organic Liquid with High Halo- gen Concentra- tion (>2% halides, <50 ppm PCB)	Solvents		PS/U	U		
	Oil			U		
	Pesticides, Herbicides			U		
	Other		PS/U	U		

(continued)



TABLE 19. (continued)

Waste Segregation	Waste Type	Aqueous Treatment	Recovery/ Recycle <sup>a</sup>	Incineration	Solidification/ Fixation/ Dewatering	Secure Land Burial
Aqueous Acid	Acids with or without heavy metals	PS/U			P*	LD*
	Organic Acids	PS/U*		U*	P*	LD*
Aqueous Base Contaminated With Cyanide	—	U				
Aqueous Base Contaminated With Sulfide	—	U				
Aqueous Base	Alkalines pH 7-12 with or without heavy metals	PS/U			P*	LD*
	Organic Alkalines	PS/U		U*	P*	LD*
Solid Material Uncontaminated w/PCB (<50 ppm)	Inorganic Acid Sludge				P**	LD
	Inorganic Alkaline Sludge				P**	LD

(continued)

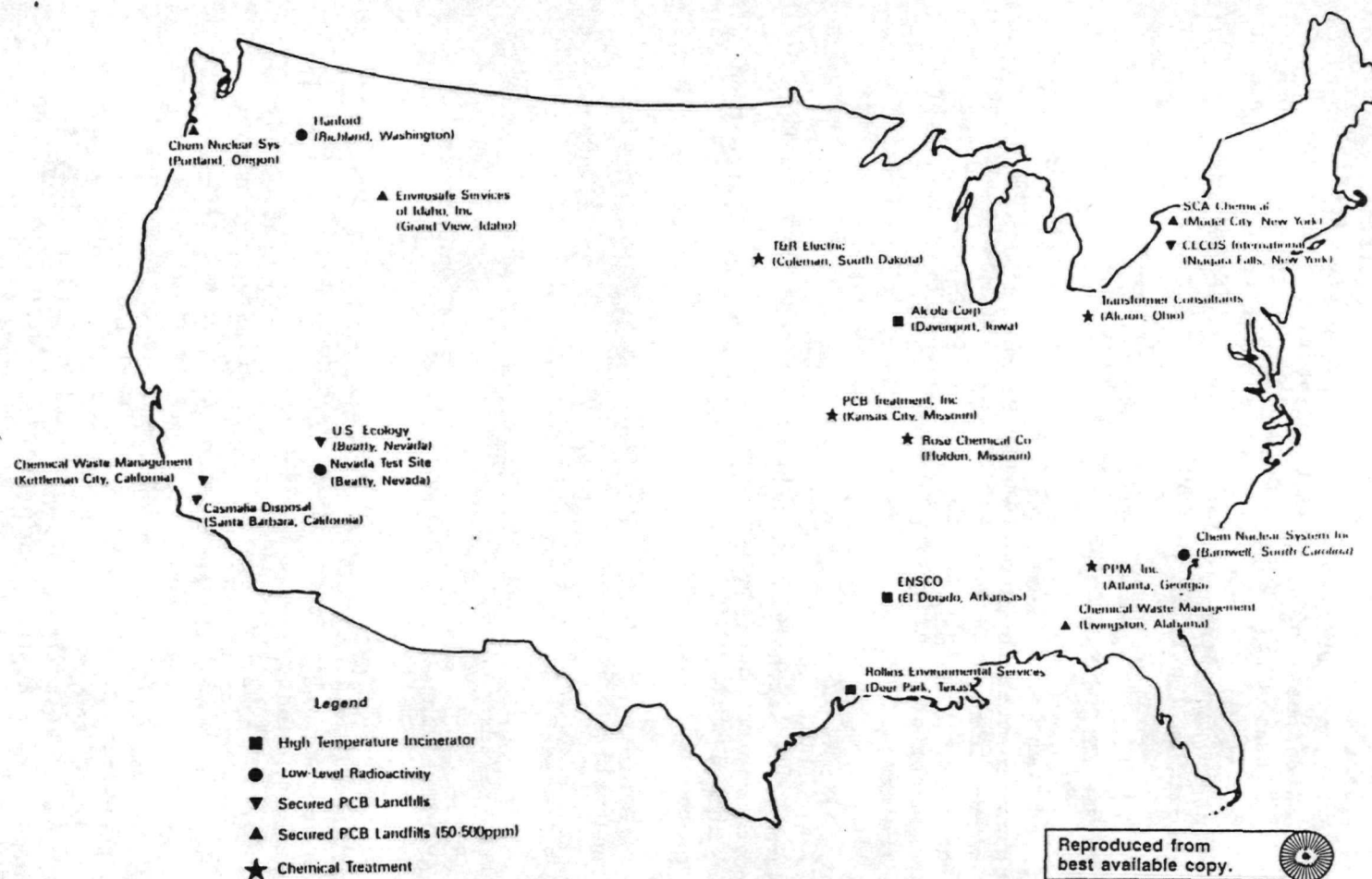
TABLE 19. (continued)

Waste Segregation	Waste Type	Aqueous Treatment	Recovery/ Recycle <sup>a</sup>	Incineration	Solidification/ Fixation/ Dewatering	Secure Land Burial
Solid Material Uncontaminated w/PCB (<50 ppm) (continued)	Organic Acid Sludge			U*	P	LD
	Organic Alkaline Sludge			U*	P	LD
	Salts/ pure organic			U	P	LD
	Tar/ Residues (i.e., still bottoms filter cake, spent catalyst, etc)			U	P	LD
	Other Organic Sludges			U	P	
	Metals		PS		P	LD
	Asbestos			P	U	
PCB Contaminated Material	50-500 ppm	PS		U	P	LD
	>500 ppm	PS		U		

U.S. EPA, 1981b

Key

- U = Ultimate Disposal  
 PS = Pretreatment Sidestream  
 P = Pretreatment  
 LD = Land Disposal  
 \* = Solid Phase Only  
 \*\* = Neutralization Part of Process  
<sup>a</sup> = Recovery/recycle includes fuel blending, auxiliary fuels and product recovery



**Figure 39. Locations of Treatment/Disposal Facilities for PCBs or Radioactive Wastes**

(Sources: USEPA, 1983b; USEPA, 1983c; USEPA, 1983d)

Note: Mobile incinerators, mobile treatment system, and permitted boilers are not included. Permitted chemical treatment facilities may not accept outside wastes.

the location of facilities capable of secure landfilling of low-level radioactive wastes and PCB containing wastes and of high temperature incineration of PCB liquid wastes in excess of 500 ppm. The facilities capable of handling low-level radioactive wastes have very specific requirements regarding types, concentrations, and packaging of radioactive materials. Requirements for the land disposal of low-level radioactive wastes are outlined in the Low-Level Radioactive Wastes Policy Act of 1980 and 10 CFR Parts 10, 19-21, 30, 40, 51, 61, 70, 73, and 170. Requirements for treatment and disposal of PCB-containing wastes are outlined in 40 CFR Part 761. The PCB requirements are summarized briefly in Figure 40.

#### PREPARATION OF LIQUID WASTES FOR FINAL TREATMENT OR DISPOSAL

Once the final treatment or disposal options have been determined, the wastes are then prepared to meet the requirements of the treatment or disposal facility and the transportation regulations. In some instances this involves pretreatment of the wastes. In other cases, compatible wastes are simply bulked for transport or transferred into a DOT-approved container or fiber container in the case of onsite incineration.

##### Onsite Pretreatment

Onsite pretreatment of wastes may be required to make them acceptable for offsite transport, to meet the requirements of the treatment facility, or to allow them to be bulked with other similar wastes. Onsite pretreatment is generally limited to the following:

- Acid-base neutralization
- Metal precipitation
- Hypochlorite oxidization of cyanide and sulfide
- Flash point reduction (use of a Freon-based flash suppressant).

Chemical reactions should be carried out under carefully controlled conditions using a "compatibility chamber" or reaction tank for mixing wastes. O.H. Materials, Findlay, Ohio (undated), developed a 38,000 liter (10,000 gallon) "compatibility chamber" that monitors the heat of reaction using thermocouples mounted in the chamber. A nonsparking bar scraper with explosion-proof drive, prevents sludges and solids from entering the collection chamber. Other cleanup contractors use small storage tanks. If opened, the tank should have a minimum of 2 feet of freeboard or some sort of containment structure equal to the volume of 2 feet of freeboard. Ideally, the storage tanks should have some type of closure and should be painted black to control loss of volatiles. Drums should be emptied into an open chamber or tank using the grapppler. This provides for a safe and rapid means of bulking wastes (Figure 41). Hydraulic drum dumpers (Section 7, Figure 20) are also suitable for dumping the contents of drums into a reaction tank.



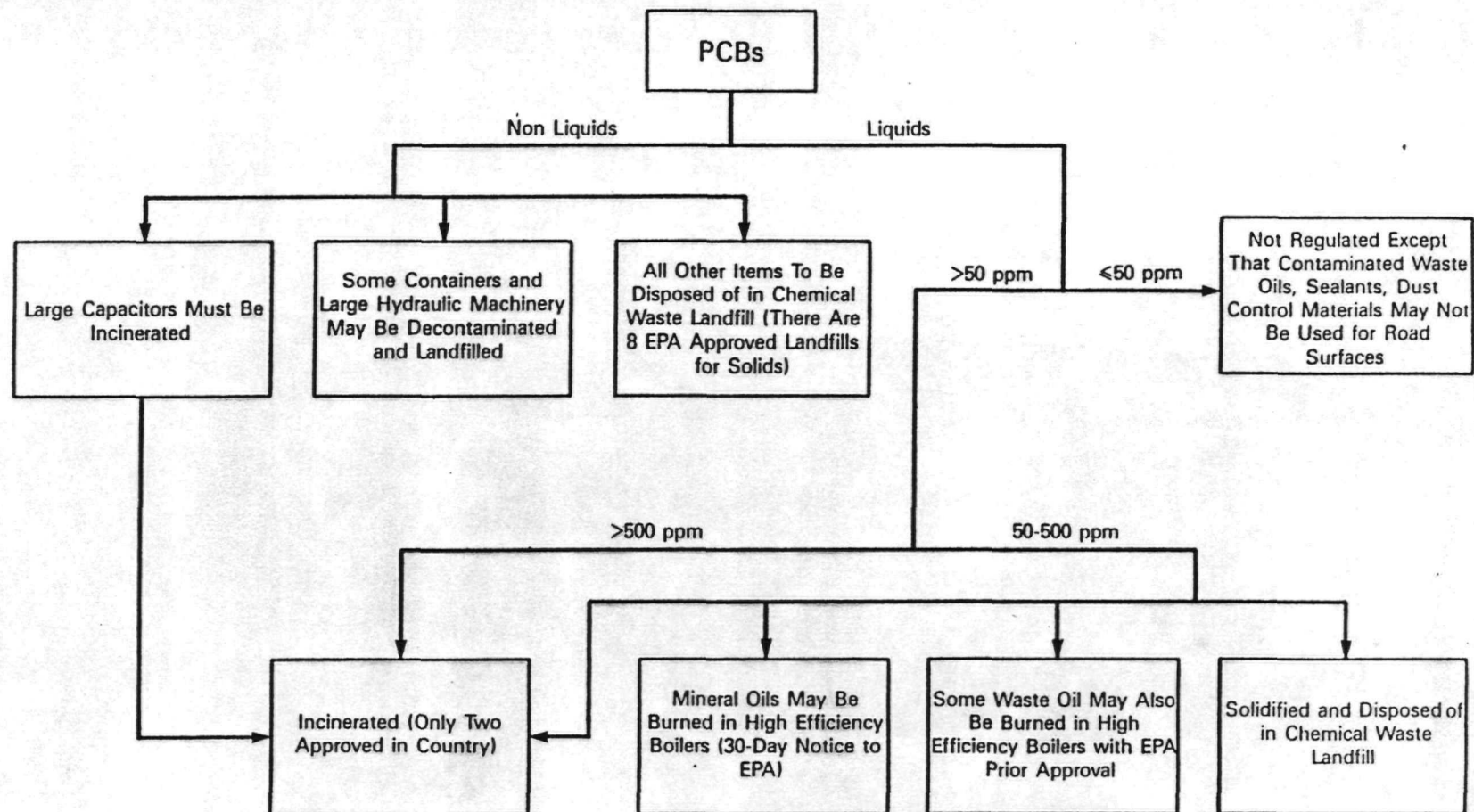
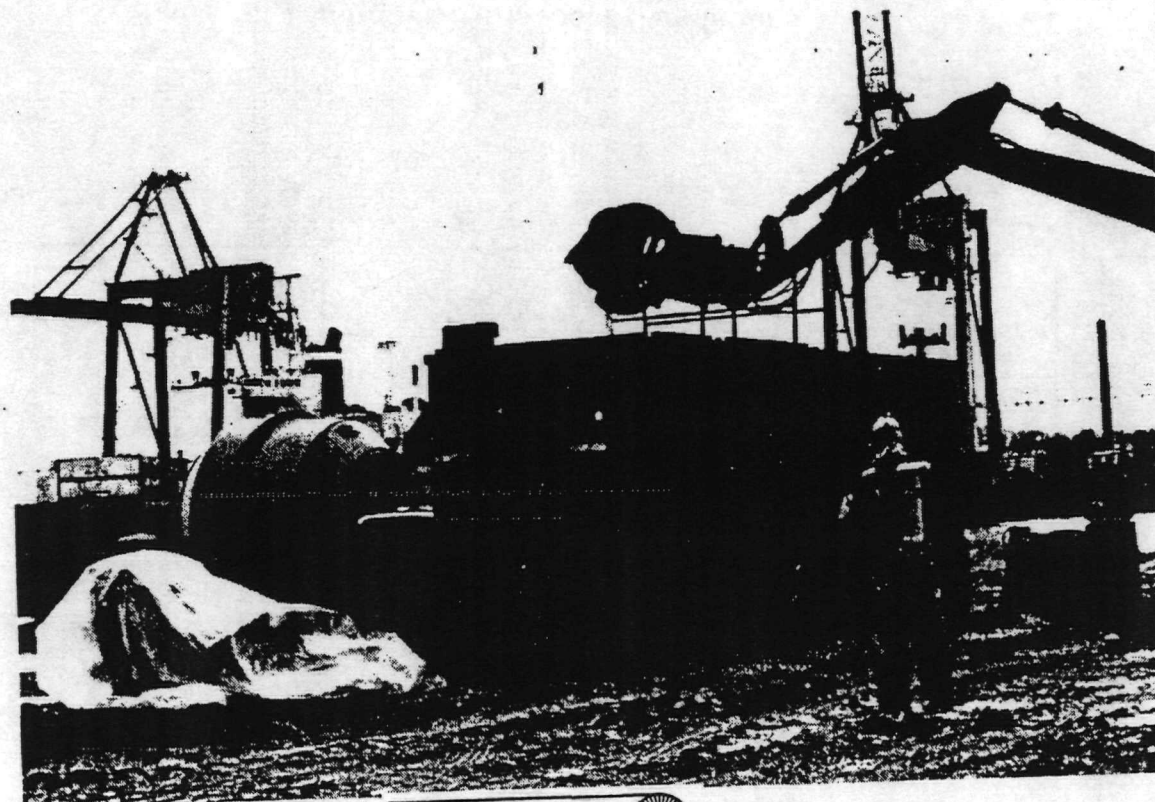


Figure 40. Federal PCB Disposal Regulations



Reproduced from  
best available copy.



Figure 41. Use of Grappler Arm and Compatibility Chamber for Combining Compatible Wastes

(Courtesy of O.H. Materials Co., Findlay, OH)

## Consolidation

In instances where the contents of a large number of drums can be consolidated for purposes of treatment or disposal, vacuum equipment can offer a highly efficient approach to consolidation.

Vacuum trucks are available in capacities ranging from about 4,700 to 23,000 liters (1,250-6,000 gallons.) They are available in a range of vacuum strengths and with a wide variety of options. Figure 42 illustrates a number of available options for one manufacturer's line of equipment (Huber Manufacturing Inc., undated).

Portable skid-mounted vacuum units are also available. They can be airlifted, dragged by bulldozer, or even hauled on the back of a pickup truck to otherwise inaccessible areas. These units are generally available in capacities ranging from 1,900 to 5,700 liters (500-1,500 gallons), although units that can handle up to 11,400 liters (3,000 gallons) are manufactured. Skid-mounted units with vapor recovery systems are also available.

A number of factors should be considered prior to contracting for the services of a vacuum truck. Because of the large capacity of the vacuum cylinder, vacuum trucks are generally not well suited to sites with fewer than 30 drums to be consolidated. For a small site it is generally more cost-effective to overpack the drums or to use a vacuum skid-mounted unit. This is due to the high transportation costs and cost of handling wastewater generated from decontaminating the truck. The water or solvent used in decontamination is considered hazardous and must be disposed of or treated as such. Highly hazardous chemicals such as PCBs require stringent decontamination procedures in accordance with the Toxic Substances Control Act (TSCA).

The cost of decontamination can be substantially reduced by a number of good management practices. The vacuum truck or skid-mounted unit should be dedicated as much as possible to handling a certain type of waste so that decontamination is not required between each load. The units should also be sized for the job so that excessive decontamination water is not generated as a result of choosing an oversized vacuum cylinder.

Another important factor to consider in selecting vacuum trucks or skid-mounted units is the compatibility of wastes with materials of construction. Vacuum cylinders can be purchased in carbon steel, stainless steel, aluminum, nickel, etc., and/or with a variety of coatings including epoxy, fiberglass, and neoprene rubber. In addition to selecting vacuum trucks with compatible liners, compatibility problems can be minimized by allowing wastes to react in a "reaction tank" or "compatibility chamber" where the heat of reaction can be released before pumping the wastes into the vacuum truck.

In addition, when a grappler is available, it is often more efficient to dump the contents of the drums into a chamber or tank and transfer the load to the vacuum truck rather than to load each drum separately into the vacuum truck.



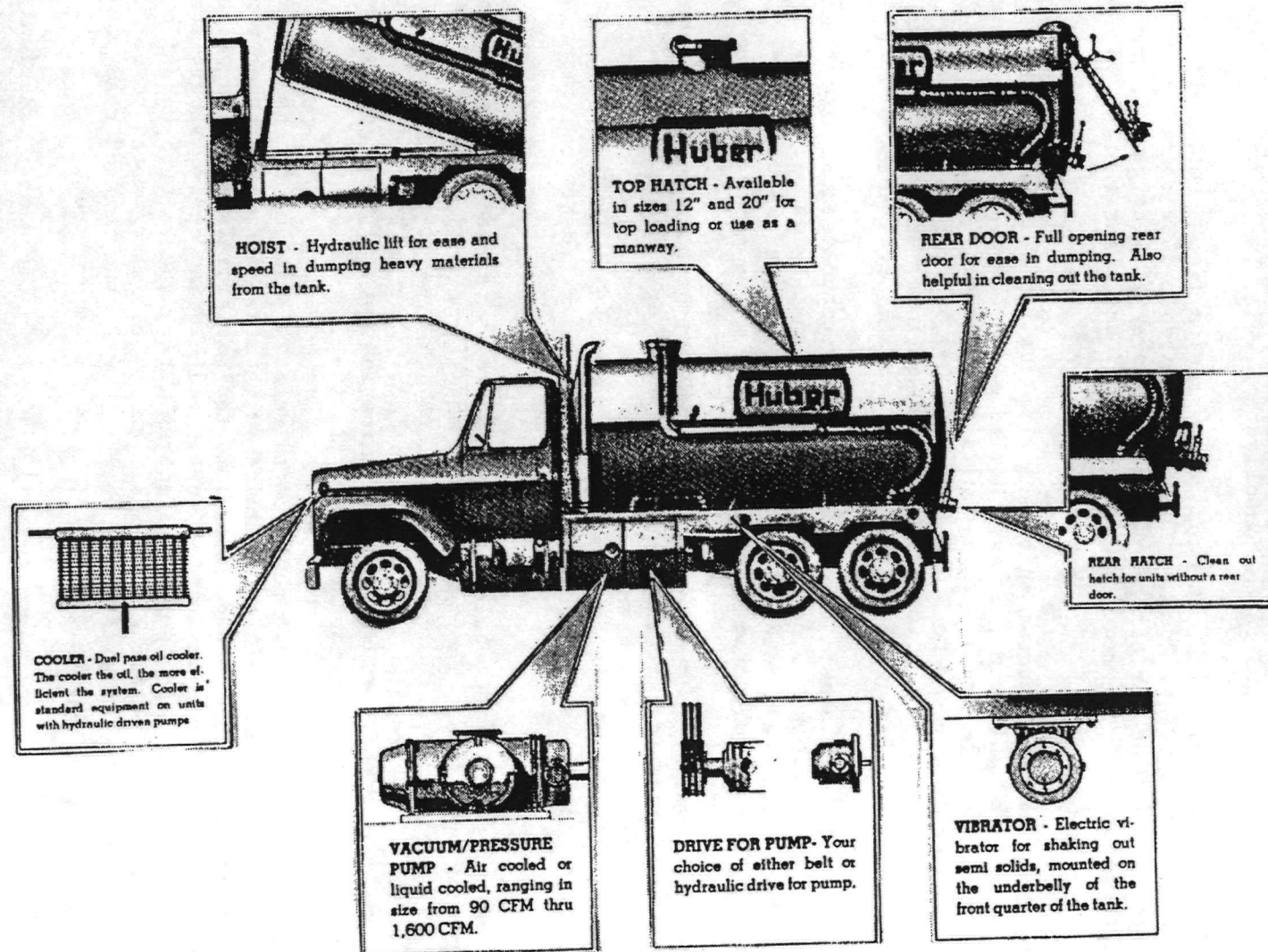


Figure 42. Available Options for Streamline Vacuum Trucks

(Courtesy of Streamline Manufacturing, Gulfport, MS)



### Use of Overpacks and Drums

Under certain circumstances it is more economical or acceptable to transport liquid wastes in drums or overpacks rather than to bulk them. This is the case when the number of drums containing compatible waste types is too few to make the use of vacuum equipment economical or when there are a few drums that contain highly toxic or incompatible wastes that cannot be bulked with other wastes without contaminating the load.

Procedures for overpacking or transferring liquids to new drums were discussed in Section 7. Drums or overpacks must meet with DOT specifications with regard to waste-container compatibility, packaging, and labeling before being transported offsite. Specifications are found in 49 CFR 172 through 179. If wastes are to be incinerated, fiber drums should be considered as an alternative to steel drums. Fiber drums generally can meet DOT requirements by lining or overpacking them (Gordon, 1982). The use of a fiber drum rather than a steel drum greatly simplifies the incineration process.

In instances where the contents of several partially filled drums are to be combined, a simple flow gauge can be used to monitor the liquid level in the drums to prevent overfilling. These gauges fit into standard bungs and can be easily adjusted to any desired liquid level (Industrial Safety and Material Handling, 1981; BASCO, 1982).

### PREPARATION OF SOLID WASTES AND SOILS FOR FINAL TREATMENT OR DISPOSAL

Secure landfilling is the most common means for ultimate disposal of solid wastes including sludges, process residues, still bottoms, and highly contaminated soils. RCRA, State, and DOT regulations will dictate the type of pretreatment required to make the waste acceptable for secure landfilling. Soils and wastes may be bulked, transferred to a new drum, or overpacked depending upon specific waste and site conditions and requirements of the secure landfill. Incineration can be a viable alternative to landfilling some solids provided water content and heavy metal concentrations are low. Solidification/stabilization methods are also a potential treatment option, but their use is limited to highly toxic materials because of the high cost of solidification.

### Use of Drums and Overpacks

In many instances, drums containing sludges and solids are overpacked or their contents are transferred to new or reconditioned drums. Highly contaminated soils are sometimes drummed as well if the volume is small.

RCRA land disposal regulations require that all free-standing liquid be removed by decanting or by mixing with sorbents before landfilling. No visible pools or layers of liquid are permitted (Federal Register, March 22, 1982). One common practice is to mix contaminated soils with the drummed waste to absorb the free liquid. Other absorbents commonly used include cement kiln dust, fly ash, fuller's earth, saw dust, and vermiculite. A number of other stabilization/solidification processes are available

including encapsulation, cement-based processes, thermoplastic processes, organic polymer techniques, and lime-based processes. Success with these methods is highly waste specific. The cement-based and lime-based processes that use relatively cheap and readily available materials have more practical applications than other solidification/stabilization methods. Cement- and lime-based solidification may be used to solidify inorganic sludges, although the tendency at hazardous waste sites is to use absorbents such as saw dust, fuller's earth, etc., rather than the more time-consuming solidification processes.

### Consolidation

Large volumes of contaminated soils and solid wastes are generally prepared for transport by combining compatible wastes and loading them in a box trailer. As indicated in Section 7, highly contaminated soils and spilled waste materials that are excavated during the drum removal operation either are transferred to a diked and lined storage area or vacuumed as encountered using high-strength industrial vacuum loaders ("Vactor" or "Supersucker"). Compatible solids and sludges in drums may be combined with these highly contaminated soils to provide a more economical method of packaging and transporting solid wastes. Sludges and solids may be mixed directly with the highly contaminated soils along with absorbent material to create a stable waste pile that is free of visible liquids. These wastes can then be transferred to a box trailer truck, Vactor or Supersucker. In instances where the sludges and solids are to be transferred from drums to a Vactor or Supersucker, the wastes should first be dumped into a compatibility chamber to avoid reactions that could damage the vacuum system's storage box. Where box trailers are being used, they should be lined and covered with a layer of sorbent material. The soils and solids can be rapidly transferred into the box trailer using a backhoe or a front-end loader (Figure 43).

### Handling Nonhazardous Soils

Soils that are determined by laboratory analysis to be nonhazardous are generally not landfilled but treated or left onsite. There are several alternatives available for handling slightly contaminated soils depending on the type of wastes, the volume of soils, and the site location. These include:

- o Backfilling excavation trenches if contaminant levels are very low
- o Aerating the soils using a rototiller to release organic vapors
- o Employing microbial degradation using indigenous or adapted microorganisms with or without addition of nutrients and air
- o Using chemical treatment methods such as neutralization, redox reactions, or precipitation.

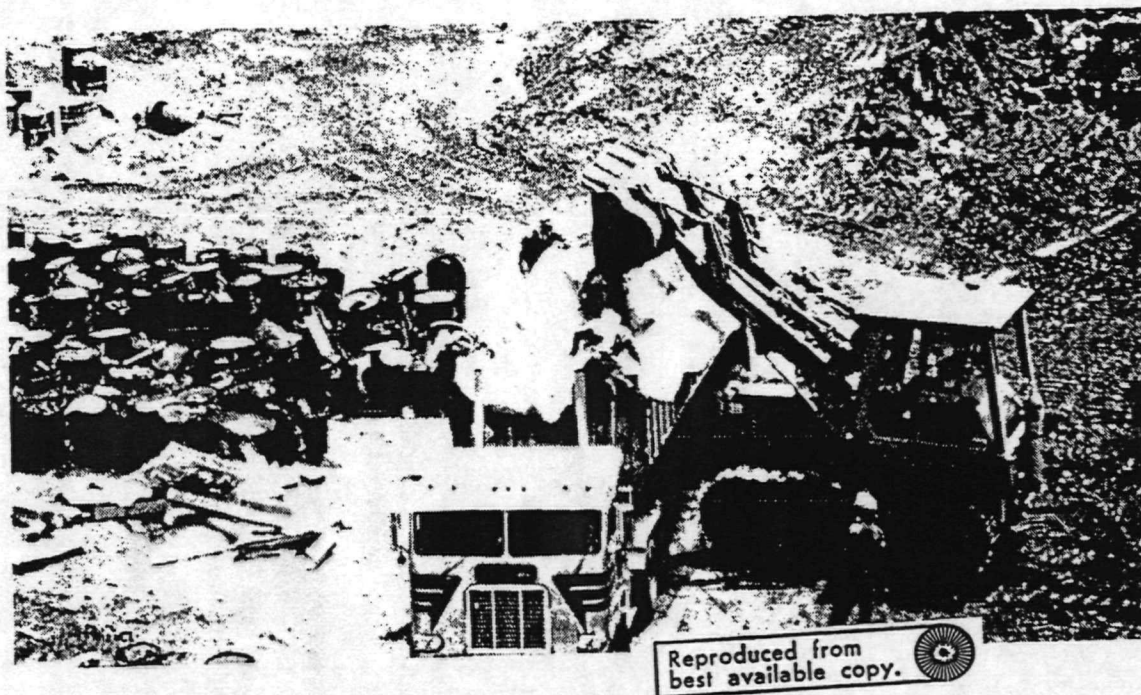


Figure 43. Combined Handling of Sludges and Contaminated Soils at the Chemical Control Site

(Courtesy of O.H. Materials Co., Findlay, OH)



## GAS CYLINDERS

Once compressed gases are identified by sampling, they can be disposed of by one of several methods. However, extreme care must be taken in choosing the appropriate treatment alternative and in handling the gases. If possible, the gas supplier should be contacted for appropriate handling techniques. Physical, chemical, and toxicological data for specific gases should be consulted prior to selecting the appropriate treatment method. Safe handling procedures should be followed at all times. The cylinders should never be dragged even for short distances or permitted to strike each other. Protective caps should be kept over the valves at all times (Matheson Gas Products, undated).

Gas cylinders can be disposed of using the appropriate method discussed below (Matheson Gas Products, undated):

- Return to the manufacturer or supplier if known
- Vent confirmed nontoxic gases - cylinders containing inert gases such as helium, argon, or nitrogen do not represent a hazard unless they are situated in a confined place with no ventilation. The cylinders should be moved to a well-ventilated outside area, and the gases should be discharged or vented at a moderate rate. After the gas has been discharged the valve should be closed.
- Chemical treatment - Some alkaline and acidic gases may be chemically treated but should be done so with extreme caution since these gases are corrosive and toxic. Alkaline gases are flammable, as well.

Alkaline gases such as ammonia and the lower alkyl amines should be handled as follows: the cylinders should be moved to an isolated area free of all sources of ignition. A control valve equipped with a trap or check valve should be attached to the cylinder and a long piece of flexible hose should be connected to the control valve outlet. The gas should then be discharged at a moderate rate into an adequate amount of sulfuric acid solution. When the cylinder is empty, the control valve should be closed and the resultant solution treated and disposed.

Acidic gases are handled similarly. However, the gases should be discharged into an adequate amount of about 15 percent aqueous sodium hydroxide.

- Destructive combustion - The best procedure for disposing of flammable gases is controlled burning in an isolated area.

## LAB PACKS

The first step in handling lab packs is to manually separate the individual bottles in the drums into categories of knowns, unknowns, and debris. This is accomplished by observing labels, physical appearances, and general chemistry (i.e., pH, corrosivity, reactivity, explosiveness) of contents, and by determining the origin of the lab pack itself. Care should be taken to preserve any labels or partial labels present.

Known materials are handled by segregating them into compatible groups. The chemically compatible bottles can either be repacked in conformance with appropriate U.S. EPA, and DOT regulations regarding shipment, or they can be bulked for treatment or disposal.

Unknowns should be stored separately from known materials. If possible, the generator of the lab packs should be contacted to assist in material identification. Containers that are unknown should be separated into similar groups based on such characteristics as physical state, color, particle size, etc. A shock test should be performed on samples from each group to determine whether it is safe to open the containers within the group. After the shock test, the remaining containers should be opened, checked for visual similarity, and randomly sampled for compatibility testing.

Explosive fractions of lab packs must be handled with extreme care and require the presence of an expert in explosives. However, when there is reason to believe such chemicals are present, extreme care is necessary during staging and characterization activities. Aside from the shock test, one indication of the presence of explosive or shock-sensitive compounds is the formation of crystals around the caps or within individual bottles.

Any explosive material that is identified should first be labeled and placed within a remote bunker or staging area in a vermiculite filled container until all of the waste is categorized. The location of a staging area for explosive wastes should be based upon a careful evaluation of the quantity of explosives and their relative hazard. The staging area should be enclosed with a fence or dike to minimize the adverse effects of any premature detonation.

The treatment of explosive or shock-sensitive wastes differs from that of other categories of hazardous wastes. Typically, these types of wastes are either detonated or incinerated under very controlled conditions. Detonation at a specially designated site or uncontrolled waste site, if sufficiently remote, is a widely accepted practice for disposal of explosives.

Once a sufficient quantity of explosive material has been categorized and a remote site has been located for detonation, the State Fire Marshall should be contacted to detonate the wastes. For the removal and disposal of explosive waste, one basic permit is required from the U.S. Bureau of Alcohol, Tobacco, and Firearms. The permit requirement is associated with the actual transport of explosives and the purchase of any explosive

materials required to detonate the waste material. Once the Federal permit is secured, written approval from the State and local governments is required before detonation is begun.

Typically, a bomb trailer would be employed to transport the wastes to the site. Wastes would be segregated according to their chemical compatibility and shock sensitivity. For example, very shock-sensitive material such as blasting caps and nitroglycerin would not be transported with nonshock-sensitive materials possessing explosive properties. This would ensure that premature detonation of a shock-sensitive item would not result in a detonation of more stable explosives.

Detonation should be accomplished by exploding downward into clean, moist earth. At the Picillo Farms site, the detonation area was to be triple lined with at least 2 feet of soil between each layer of 6 mil polyethylene plastic film (Perkins Jordan, Inc., 1982). The debris remaining after the explosion should be cleaned up before the next explosion is prepared.

#### DRUM CRUSHING

There are several options available for handling empty drums. Generally, as the empty drums are excavated or generated during consolidation they are transferred into a dump truck and hauled to a drum crushing area. Depending upon the site and hazard of the wastes which were stored in the drums, the empty drums may be crushed daily to minimize the release of volatile compounds or they may be stored temporarily. If the empty drums are temporarily stored, measures should be taken to prevent the accumulation of precipitation in the drums and leaching of residues into the ground. These measures might include: diking the empty drum staging area, lining it with plastic, clay, or sorbent material and covering the empty drums with a liner material.

Before crushing, the drums should be checked for liquid and solid residue. Drums containing more than 5 centimeters (2 inches) of residue should not be considered empty. Liquid residue should be transferred to a compatibility chamber or reaction tank. Solid residue should be shoveled or scrapped out and transferred to a bulk storage trailer.

Use of a portable hydraulic drum crusher is generally the most efficient method for crushing large numbers of drums. Drums can be crushed to a thickness of 20 centimeters (8 inches) or less. In instances where the residues are highly toxic or difficult to remove, a drum shredder can be used. O.H. Materials has a shredder that uses negative air pressure to prevent escape of vapors (personal communication with R. Graziano and S. Insalaco, O.H. Materials, Findlay, Ohio, 1982). If the number of empty drums onsite is few, a backhoe or front-end loader can be used for crushing.

Generally, crushed drums are disposed of in bulk storage trailers without segregating them into the compatibility class of the waste that they contained. However, some disposal facilities do require that they be



segregated into compatible waste categories. If there are very few empty drums onsite, it may be cost-effective to overpack them and haul them with drums to disposal.

#### DECONTAMINATION

All equipment, facilities, and field personnel must be decontaminated before entering the clean zone. Procedures for personnel decontamination are detailed in several of the references on waste site safety procedures listed in Section 3 and will not be discussed here.

The equipment decontamination area should preferably include a hard surface pad (concrete or asphalt) that is diked or bermed to collect rinse water and a collection sump from which the contaminated water can be collected and treated. Where the site is highly degraded and further remedial actions are anticipated, all of the precautions may not be required.

Equipment decontamination may include degreasing if required, followed by high-pressure hot water rinsing with low volume nozzles, supplemented by detergents and solvents, as needed (U.S. EPA, 1982c). In winter it may be necessary to add alcohol to water to prevent freezing. In order to reduce the volume of rinse water generated, brushes and scrapers may be initially used to remove packed or caked contaminated soils. Special attention should be given to material on and within the tracks and sprockets of crawler equipment, and tires and axles of trucks and rubber-mounted equipment (U.S. EPA, 1981b). Any small tools or personnel safety equipment that cannot be decontaminated should be overpacked and disposed of in a secure landfill.

Decontamination of temporary facilities erected onsite for the cleanup operation is generally limited to low-volume, high-pressure, hot water rinsing. More rigorous decontamination procedures may be required for warehouses or trailers if drums were stored in them.

# Reasons behind the slice or pull

Here's why your shots are going right or left and how to correct it

*John DalCorobbo is a golf teacher at Forest Akers East.*

The flight of the ball is a combination of five factors that the player controls. Most golfers know their ball flies one way or the other, but lack the sufficient knowledge why the ball curves one direction or another.

Understanding what caused the ball to fly a certain direction will enable the player to know the swing path and the clubface at impact, and empower them to be able to redirect their efforts in the swing they're trying to make.

The five ball-flight laws:

- 1. Clubhead speed.
  - 2. Centeredness of contact.
  - 3. Angle of approach.
  - 4. Path of swing.
  - 5. Clubface position at impact.
- Distance the ball travels is directly related to the first three ball flight laws. The speed of the club, the cen-

teredness of contact and the angle of approach at impact are influenced by the physical strength, flexibility and swing technique of the player.

Golfers who search for improved yardage need to increase their clubhead speed as well as the centeredness of impact. The higher handicap player has a hard time finding the sweet spot on the clubface. A drive with impact 1/2-inch from the sweet spot reduces the distance the ball will travel by 12 yards. Impact 3/4 of an inch from the sweet spot will reduce distance by 30 yards. The golfer trying to improve distance needs to improve technique which will allow them to find the sweet spot with regularity and eventually increase their swing speed.

The angle of approach influences the distance a shot travels because of the amount of spin induced on the ball. A steeper angle of approach creates more backspin, which causes more lift and less distance. The more the angle of approach deviates from the correct swing arc, the less energy can be transferred to the ball. Maximum



**John  
Dal Corobbo**

*Tips for  
your game*

distance requires that the ball be struck on an angle of approach with the clubhead that allows for the maximum energy transfer.

The two factors the player can greatly influence in the swing that result in direction of the ball are the path of the swing and the clubface position at impact. The direction in which the ball starts will always be a combination of club path and clubface position at impact. The club path directly influences the initial direction the ball travels on. The direction the ball curves in the air is directly influenced by the clubface.

The relationship of the clubshaft to the target line offers the golfer a valuable reference tool to help them

determine the path of their club.

If the clubshaft is outside the target line coming into impact, the player will have a pattern of two shots. The player with an outside shaft angle coming into impact will either hit the ball left to right or slice, pull hook or hit a straight pull shot. This is the most common mistake made by golfers — coming into the ball on too steep of an angle with an outside-in club shaft at release point that leads to a slice or pull.

To hit the ball straight or hook it the golfer must have a clubshaft that's parallel or inside the line of flight. To maintain the clubshaft parallel to the target line the player must have the club on plane during the swing.

So the initial start line of the ball is the effect of the clubshaft's relationship to the target line. The flight of the ball or the direction the ball falls from its apex is the effect of the clubface. Once the player understands that the ball corresponds to the relation of the clubshaft, target line and squareness of clubface at impact they can make the corresponding change to the swing to create the ball flight they desire.





**Attachment D**  
**OSWER Directive 9380.0-3**

EXAMPLE OF A  
BULKING AND CONSOLIDATION PROTOCOL

Purpose

The concept of the bulking and consolidation protocol is to segregate wastes based on water content, acidity, water solubility, and reactivity in anticipation of ultimate disposal.

Technique

The protocol (a) assumes the waste contains complex mixtures of solids and liquids of unknown source and concentration; (b) subdivides the liquids into general disposal categories; (c) determines that wastes within a group are compatible by actual compatibility testing; (d) provides that each compatibility group composite is tested for PCB to ensure that contaminated material is disposed of properly; and (e) provides that compatible materials are then bulked in batches for disposal ("Disposal Units") - for liquids and solids, 50 drums or 30,000 lbs, respectively. All solid material should be moved off-site in individual containers only.

Other points considered in this approach include the following:

- Radioactive waste shall be identified both at the initial stage of site evaluation as well as during the sampling of individual containers.
- Waste containing peroxides, and toxic gas-forming compounds (cyanide, sulfide) should be identified and segregated for special treatment. Consolidation at a later date may be advisable but only after performing the compatibility testing procedure as outlined in the protocol.
- Tests for water solubility, reactivity and water content shall be used to classify organic, aqueous-soluble organic and inorganic wastes. (The organic/aqueous and aqueous wastes include emulsions). Very often density is an indication of structure (i.e., if liquid is heavier than water, halogen is probably present).
- Samples shall be tested for organic halogen content, however, the test procedures done in the field only detect gross amounts; 1-2 percent. Samples shall be retested for PCBs before disposal, and

before one contaminates larger batches. This is why lab size consolidated mixtures are tested prior to consolidation to avoid contamination.

- Wastes containing multiple phases shall be treated separately and all phases analyzed.
- The compatibility test shall be performed on-site by mixing small samples (left over from analyses). Visual observation for precipitation, or phase separation and temperature measurement (to test for chemical reactions) shall be made.
- All of these analytical tests shall be performed on-site using relatively simple procedures and equipment. Analysis for EP toxicity and PCBs shall be done by the contractor.
- The analytical procedure for determining halogen content shall determine gross halogen content (>1%). Tests for PCBs shall be done to determine ultimate disposal if disposal is in a non-PCB approved incinerator. Tests shall be conducted on the lab composites prior to mixing drum contents so one can isolate the contaminating container and/or change the mixing sequence as required to avoid PCB contamination.

A simplified logic diagram for the consolidation protocol is presented in Figure 1.

Chemical characterization in anticipation of ultimate disposal, is designed to test composite samples taken from individual drum sample aliquots. No bulking or consolidation should be done until the result of the analyses of the "lab scale" composite are reviewed to preclude the inadvertent contamination of a consolidated lot by a highly concentrated component such as PCB. The testing and analytical procedures to be used on the consolidated materials should be that required for transport and disposal of material which will vary dependent on the method of disposal.

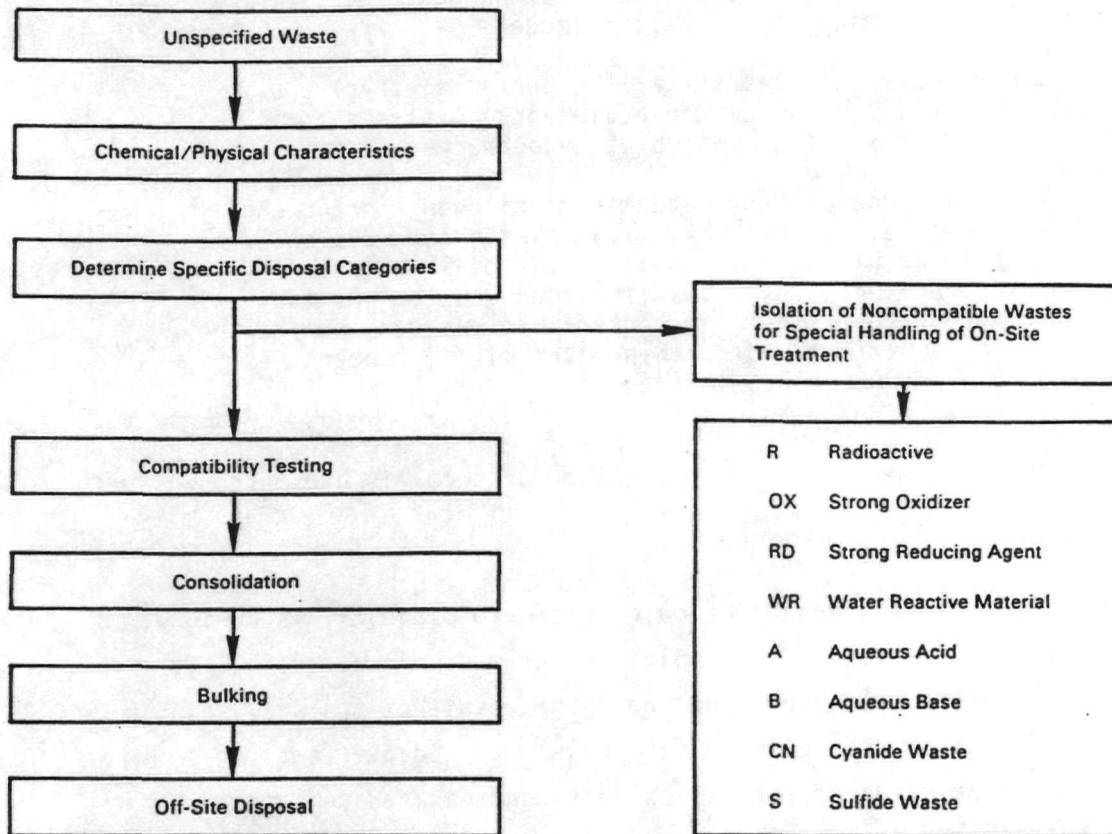
Following chemical characterization, those wastes that for chemical or physical reasons cannot be bulked should be consolidated in approved drums pending disposal. The Contractor should, as far as practical, use the full volume of each drum. Shipment from site of partially empty drums of solid waste should be kept at a minimum.

#### Limitations

Not applicable



Figure 1. Simplified logic diagram waste consolidation protocol.



COMPATIBILITY OF HAZARDOUS WASTE GROUPSGroup 1-A

Acetylene sludge  
Alkaline caustic liquids  
Alkaline cleaner  
Alkaline corrosive liquids  
Alkaline corrosive battery fluid  
Caustic wastewater  
Lime sludge and other corrosive  
alkalies  
Lime wastewater  
Lime and water  
Spent caustic

Group 1-B

Acid sludge  
Acid and water  
Battery acid  
Chemical cleaners  
Electrolyte, acid  
Etching acid liquid or solvent  
Liquid cleaning compounds  
Picking liquor and other  
corrosive acids  
Spent acid  
Spent mixed acid  
Spent sulfuric acid

Potential consequences: Heat generation, violent reaction.

Group 2-A

Asbestos waste, and other toxic  
wastes  
Beryllium wastes  
Unrinsed pesticide container  
Waste pesticides

Group 2-B

Cleaning solvents  
Data processing liquid  
Obsolete explosives  
Petroleum waste  
Refinery waste  
Retrograde explosives  
Solvents  
Waste oil and other flammable  
and explosive wastes

Potential consequences: Release of toxic substances in case of fire or  
explosion.

Group 3-A

Aluminum  
 Beryllium  
 Calcium  
 Lithium  
 Magnesium  
 Potassium  
 Sodium  
 Zinc powder and other reactive  
 metals and metal hydrides

Group 3-B

Any waste in Group 1-A or 1-B

Potential consequences: Fire or explosion; generation of flammable  
 hydrogen gas.

Group 4-A

Alcohols  
 Water

Group 4-B

Any concentrated waste in  
 Groups 1-A or 1-B  
 Calcium  
 Lithium  
 Metal hydrides  
 Potassium  
 Sodium  
 $\text{SO}_2$ ,  $\text{Cl}_2$ ,  $\text{SOCl}_2$ ,  $\text{PCl}_3$ ,  $\text{CH}_3$ ,  
 $\text{SiCl}_3$  and other water  
 reactive wastes

Potential consequences: Fire, explosion, or heat generation; generation  
 of flammable or toxic gases.

Group 3-A

Aluminum  
Beryllium  
Calcium  
Lithium  
Magnesium  
Potassium  
Sodium  
Zinc powder and other reactive  
metals and metal hydrides

Potential consequences: Fire or explosion; generation of flammable  
hydrogen gas.

Group 4-A

Alcohols  
Water

Group 3-B

Any waste in Group 1-A or 1-B

Group 4-B

Any concentrated waste in  
Groups 1-A or 1-B  
Calcium  
Lithium  
Metal hydrides  
Potassium  
Sodium  
SO<sub>2</sub>, Cl<sub>2</sub>, SOCl<sub>2</sub>, PCl<sub>3</sub>, CH<sub>3</sub>,  
SiCl<sub>3</sub> and other water  
reactive wastes

Potential consequences: Fire, explosion, or heat generation; generation  
of flammable or toxic gases.



Group 5-A

Alcohols

Aldehydes

Halogenated hydrocarbons

Nitrated hydrocarbons and other  
reactive organic compounds and  
solvents

Unsaturated hydrocarbons

Potential consequences: Fire, explosion or violent reaction.

Group 5-B

Concentrated Group 1-A or 1-B  
wastes

Group 3-A wastes

Group 6-A

Spent cyanide and sulfide  
solutions

Potential consequences: Generation of toxic hydrogen cyanide  
or hydrogen sulfide gas.

Group 6-B

Group 1-B wastes

Group 7-A

Chlorates and other strong  
oxidizer

Chlorine

Chlorites

Chromic acid

Hypochlorites

Perchlorates

Permanganates

Peroxides

Group 7-B

Acetic acid and other organic  
acids

Concentrated mineral acids

Group 2-B wastes

Group 3-A wastes

Group 5-A wastes and other  
flammable and combustible  
wastes

Potential consequences: Fire, explosion, or violent reaction.

Source: "Law, Regulations and Guidelines for Handling of  
Hazardous Waste."  
California Department of Health, February 1975.